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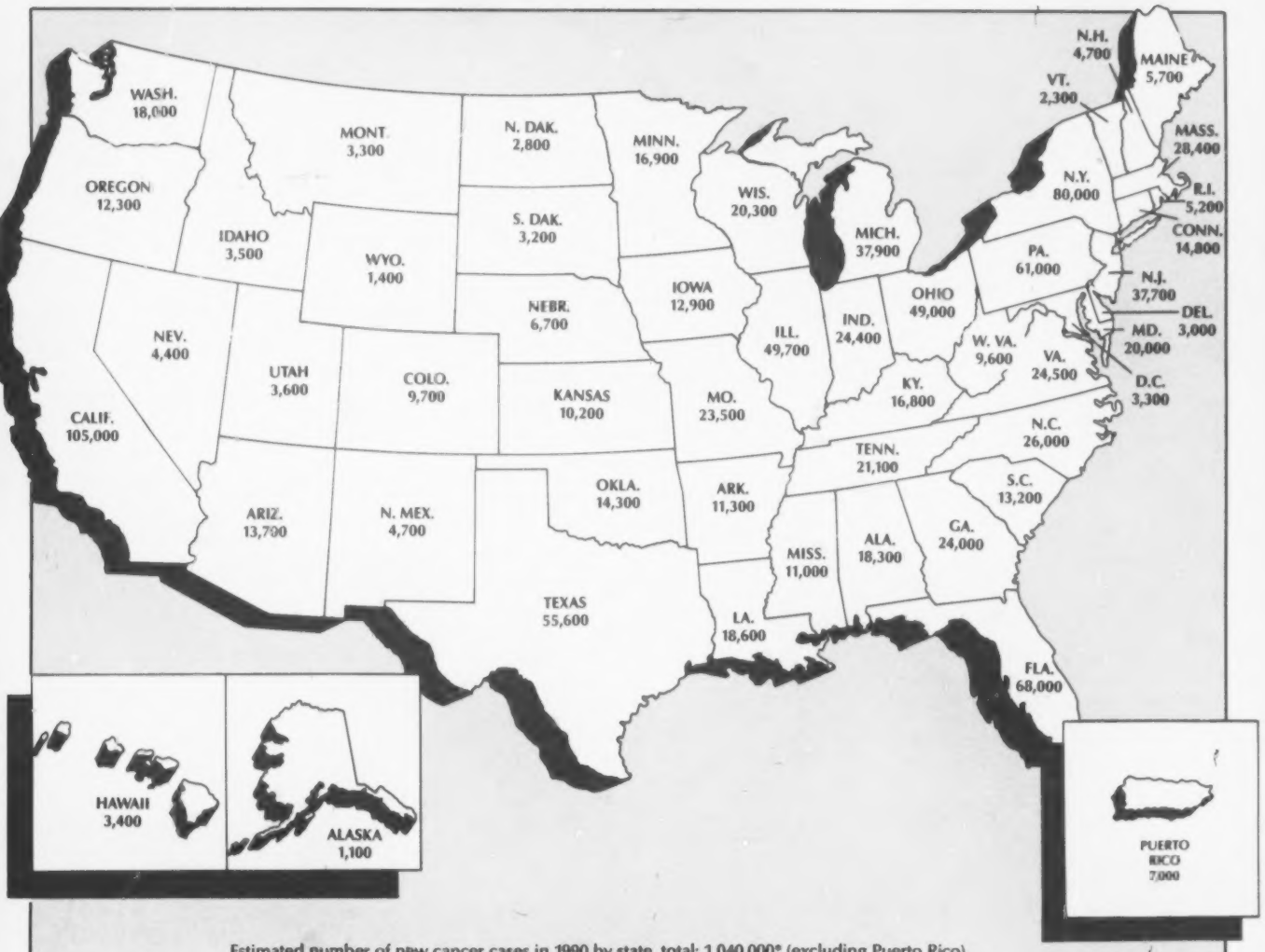
AMERICAN CANCER SOCIETY®

CANCER FACTS & FIGURES–1990



Estimated number of new cancer cases in 1990 by state, total: 1,040,000* (excluding Puerto Rico).

*Excluding nonmelanoma skin cancer and carcinoma in situ.
BASED ON RATES FROM NCI SEER PROGRAM (1984-1986).

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*Table/Chart

SOURCES OF STATISTICS

Incidence

Since there is no national office which records every new cancer case, there is no way of knowing exactly how many new cases of cancer are diagnosed each year. In the past, estimates of cancer incidence were made by extrapolating from the experience of the few population-based cancer registries.

Estimates of incidence in *Facts & Figures* editions prior to 1974 were based on data from two state cancer registries. The issues from 1974 through 1978 used information from the National Cancer Institute's Third National Cancer Survey (1969-1971) of nine major areas of the United States.

Then in 1973, NCI began a new and larger program, gathering data from 11 population-based registries. It is called SEER, standing for Surveillance, Epidemiology and End Results. Beginning with the 1979 edition of *Facts & Figures,* SEER incidence information has been used. Each time a new data base is introduced, there may be some sharp changes in figures, due to the more accurate data. The changes do NOT indicate either a cancer epidemic or miracle cure.

For valid comparisons between years, incidence statistics from the 1974 through 1978 editions of *Facts & Figures* may be compared with one another, while those from the 1979 to 1984 editions may be compared.

The latest available information for this 1990 edition is SEER data from the years 1984-1986.

Mortality

The source for mortality statistics has remained constant over the years: the National Center for Health Statistics, Department of Health and Human Services.

The 1990 figures are estimates based on the latest available information, which includes mortality data through 1986.

Beginning with the 1981 edition of *Facts & Figures,* mortality rates per 100,000 population were age-adjusted to the 1970 census population, rather than the 1940 census population. Comparing these charts and figures with those of previous years may indicate false trends.

Survival

Because of the 5-year waiting period, survival statistics take longer to compile. In this edition, we show the latest survival rates for cases diagnosed in the period 1980-1985, reported in the SEER program. The relative survival rate is the ratio of the observed survival rate for the patient group to the expected survival rate for the persons in the general population similar to the patient group with respect to age, sex, race, and calendar year of observation.

MISSION STATEMENT

The American Cancer Society is the nationwide voluntary health organization dedicated to eliminating cancer as a major health problem by preventing cancer, saving lives from cancer, and diminishing suffering from cancer through research, education, and service.

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CANCER: BASIC DATA

BASIC DATA

What is cancer?

Cancer is a large group of diseases characterized by uncontrolled growth and spread of abnormal cells. If the spread is not controlled or checked, it results in death. However, many cancers can be cured if detected and treated promptly, and many others can be prevented by lifestyle changes, especially avoidance of tobacco.

How is cancer treated?

By surgery, radiation, radioactive substances, chemicals, hormones, and immunotherapy.

Who gets cancer?

Cancer strikes at any age. It kills more children 3 to 14 than any other disease, and occurs more frequently with advancing age. In the 1980s, it was estimated there were over 4.5 million cancer deaths, almost 9 million new cancer cases, and some 12 million people under medical care for cancer.

How many people alive today will get cancer?

About 76 million Americans now living will eventually have cancer; about 30%, according to present rates. Over the years, cancer will strike in approximately three of four families.

How many people alive today have ever had cancer?

There are over 6 million Americans alive today who have a history of cancer, 3 million of them diagnosed five or more years ago. Most of these 3 million can be considered cured, while others still have evidence of cancer. By "cured" it is meant that a patient has no evidence of disease and has the same life expectancy as a person who never had cancer.

The decision as to when a patient may be considered cured is one that must be made by the physician after examining the individual patient. For most forms of cancer, five years without symptoms following treatment is the accepted time. Nevertheless, some patients can be considered cured after one year and others after three years, but some have to be observed much longer than five years.

How many new cases will there be this year?

In 1990 about 1,040,000 people will be diagnosed as having cancer.*

How many people are surviving cancer?

In the early 1900s few cancer patients had any hope of long-term survival. In the 1930s less than one in five was alive at least five years after treatment. In the 1940s it was one in four, and in the 1960s it was one in three.

Today, about 416,000 Americans, or 4 of 10 patients who get cancer this year, will be alive 5 years after diagnosis. The gain from 1 in 3 to 4 in 10 represents about 69,000 persons this year. This 4 in 10, or about 40% is called the "observed" survival rate. When normal life expectancy is taken into consideration (factors such as dying of heart disease, accidents and diseases of old age) a "relative" five-year survival rate of 50% is seen for all cancers. The relative survival rate is more commonly used to measure progress in the early detection and treatment of cancer, and is an estimate of the proportion of cancer patients potentially curable.

Could more people be saved?

The American Cancer Society estimates that 42,500 cancer deaths that occured in 1989 could have been saved through early detection and treatment. In addition the Society estimates that 142,500 lives were lost from cancer because of tobacco smoking. About 90% of the 600,000 skin cancers could have been prevented by protection from the sun's rays. Certain cancers are caused by occupational and environmental factors and can be prevented by eliminating or reducing contact with carcinogenic agents. See Prevention section, pp. 18-22.

How many people will die?

This year about 510,000 will die of the disease—1,397 people a day, about one every 62 seconds. Of every five deaths from all causes in the US, one is from cancer. In 1989 an estimated 502,000 Americans died of cancer. In 1988 it was 494,000; in 1987 the figure was 476,927.

What is the national death rate?

There has been a steady rise in the age-adjusted† national death rate. In 1930 the number of cancer deaths per 100,000 population was 143. In 1940 it was 152. By 1950 it had risen to 158 and in 1987 the number was 171. The major cause of these increases has been cancer of the lung. Age-adjusted cancer death rates for many major cancer sites have leveled off or declined over the past 50 years (see pp. 5 and 9).

*These estimates of the incidence of cancer are based upon data from the National Cancer Institute's SEER Program (1984-1986). Nonmelanoma skin cancer and carcinoma in situ have not been included in the statistics. The incidence on nonmelanoma skin cancer is estimated to be over 600,000 cases annually.

†Age-adjusted—a method used to make valid statistical comparisons by assuming the same age distribution among different groups being compared.

BASIC DATA

HOW CANCER WORKS

Normally, the cells that make up the body reproduce in an orderly manner, so that worn-out tissues are replaced, injuries are repaired, and growth of the body proceeds.

Occasionally, certain cells undergo a change that is abnormal, and thus begin a process of uncontrolled growth and spread. These cells may grow into masses of tissue called tumors. Some tumors are benign and others are malignant (cancerous).

The danger of cancer is that it invades and destroys normal tissue. In the beginning, cancer cells usually remain at their original site, and the cancer is said to be localized. Later, cancer cells may metastasize (i.e., they invade distant or neighboring organs or tissue). This occurs either by direct extension of growth, or by cells becoming detached and carried through the lymph or blood systems to other parts of the body.

Metastasis may be regional—confined to one region of the body—when cells are trapped by lymph nodes. If left untreated, however, the cancer is likely to spread throughout the body. That condition is known as advanced cancer, and usually results in death.

Systems have been designed to define what stage a cancer has reached. Because cancer becomes more serious with each stage, it is important to detect cancer as early as possible. Aids to early detection include knowing cancer's Seven Warning Signals and the Cancer Risk Factors.

TRENDS IN DIAGNOSIS AND TREATMENT

The diagnosis and treatment of cancer has become increasingly individualized. Early detection is followed by more precise staging, and the use of more than one kind of therapy, often in combination.

Some cancers that, only a few decades ago, had a very poor outlook, are often being cured today: acute lymphocytic leukemia in children, Hodgkin's disease, Burkitt's lymphoma, Ewing's sarcoma (a form of bone cancer), Wilms' tumor (a kidney cancer in children), rhabdomyosarcoma (a cancer in certain muscle tissue), choriocarcinoma (placental cancer), testicular cancer, ovarian cancer, and osteogenic sarcoma. Other cancers have not yet yielded to effective treatment, and are the focus of continuing research.

An outstanding example of progress is the improvement in the management of testicular cancer in young men. More precise diagnostic tools and staging allow better selection of treatment. The use of combinations of cancer drugs has resulted in remarkably improved survival. In 20 years, the 5-year survival rate of testicular cancer rose from 63% to 91%.

The following developments indicate the directions of current and future research:

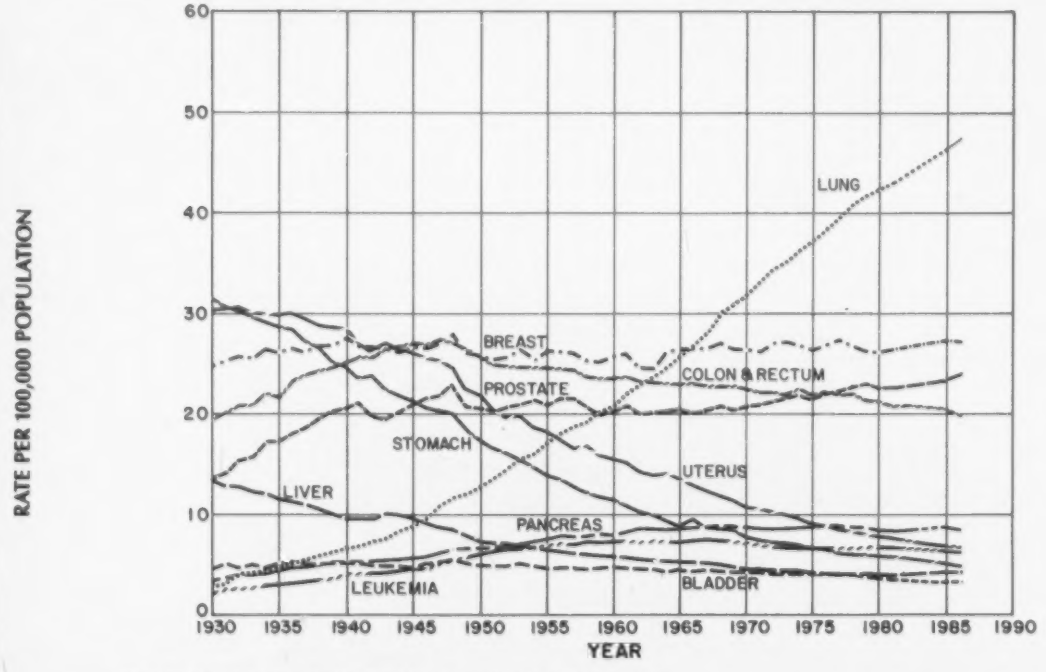
- New findings in genetics are revealing the importance of oncogenes. These genes are found in tumor cells. Their activation is associated with the transformation of normal cells into cancer cells. Analysis of products of these oncogenes is a promising new means to predict which tumors are likely to recur after surgery.
- Use of potent growth factors stimulates normal bone marrow cells to withstand very high doses of chemotherapeutic drugs.
- A genetic fusing of cancer cells with normal cells can produce disease-fighting monoclonal antibodies (specific antibodies tailored to seek out chosen targets on cancer cells). Their potential in the diagnosis and treatment of cancer is under study.
- New ways have been found to treat early breast and colon cancers with drugs postoperatively. This "adjuvant" treatment may eradicate cancer cells remaining after surgery and increase cure rates.
- New understanding of the causes of pain in cancer patients has increased the options for controlling pain. Regular use of orally administered pain medicines, infusions or injections of analgesics, and procedures to interrupt pain pathways are among the effective approaches available.
- Researchers are examining synthetic retinoids (cousins of vitamin A) and other substances to see if recurrences of certain cancers can be prevented. Another step is to see if these agents can reduce cancer in high-risk groups.
- New approaches to drug therapy use combinations of chemotherapeutic drugs, or chemotherapy plus surgery or radiation. New classes of agents are being tested for their effectiveness in treating patients whose disease is resistant to drug therapies now in use.
- Many patients with primary bone cancer now are treated successfully by removing and replacing a section of bone rather than by amputating the leg or arm. Drugs and radiation therapy are being used effectively after bone cancer surgery, resulting in dramatic improvement in survival.
- New high-technology diagnostic imaging techniques have replaced exploratory surgery for some cancer patients. Magnetic resonance imaging (MRI) is one example of such technology. In MRI, a huge electromagnet is used to detect hidden tumors by mapping, on a computer screen, the vibrations of the various atoms in the body. Computerized tomography (CT scanning) uses x-rays to examine the brain and other parts of the body. In both of these painless, non-invasive procedures, cross-section pictures can show a tumor's shape and location more accurately than is possible with conventional x-ray techniques. For patients undergoing radiation therapy, CT scanning may enable the therapist to pinpoint the tumor more precisely, and thus provide more accurate radiation dosage while sparing normal tissue.
- Immunotherapy holds the hope of enhancing the body's own disease-fighting systems to control cancer. Interferon (naturally occurring body proteins

BASIC DATA

that are capable of killing cancer cells or stopping their growth), interleukin-2 (a growth factor that greatly stimulates cells of the immune system to directly fight cancer), and other biologic response modifiers are under study. Recently, interferon was made available as the treatment for hairy cell leukemia, a rare blood cancer of older Americans. Interleukin-2 is under very active research in the treatment of kidney cancer and melanoma.

- Many cancers are caused by a two-stage process through exposure to substances known as initiators and promoters. Research scientists are exploring ways of interrupting these processes to prevent the development of cancer.
- New technologies have made it possible to use bone marrow transplantation as an important treatment option in selected patients with aplastic anemia or leukemia, and bone marrow transplantation for other cancers is under study. Because disruption of bone marrow function is a side effect of some cancer treatments, researchers are evaluating autologous bone marrow transplants, in which a portion of the patient's own marrow is removed before treatment, saved, and later restored. This procedure eliminates the problems of matching a donor with the recipient patient, and may make it possible for the patient to tolerate larger doses of anticancer drugs or radiation therapy.
- Hyperthermia is a way to increase the heat or temperature of the entire body or a part of the body. It is known that heat can kill cancer cells. A cell temperature of 45° centigrade kills cancer cells. A temperature of 42-43° centigrade makes the cell more susceptible to damage by ionizing radiation (x-rays). Studies are underway to learn if hyperthermia can increase the effect of radiation chemotherapy.
- With medical progress producing longer survival periods for many cancer patients, clinical concerns are expanding to include not only patients' physical well-being but also their psychosocial needs. The response of both patient and family to the disease, the patient's sexual concerns, employment and insurance needs, and ways to provide psychosocial support have emerged as important areas of research and clinical care.
- Improvements in cancer treatment have made possible more conservative management of some early cancers. In early cancer of the larynx, many patients are now able to retain the larynx and voice; in colorectal cancer, fewer permanent colostomies are needed; and the surgery required in many cases of breast cancer is often more limited.
- Prostatic ultrasound (a rectal probe using ultrasonic waves to produce an image of the prostate) is currently being investigated as a potential means to increase the early detection of occult (not clinically suspected) prostate cancer.
- Neoadjuvant chemotherapy (giving chemotherapy to shrink the cancer and then removing it surgically) has been successful against certain types of cancers.

CANCER DEATH RATES* BY SITE, UNITED STATES, 1930-86



*Rate for the population standardized for age on the 1970 US population.
Sources of Data: National Center for Health Statistics and Bureau of the Census, United States.
Note: Rates are for both sexes combined except breast and uterus (female population only) and prostate (male population only).

NEW CANCER CASES—1990

Estimated New Cancer Cases for All Sites Plus Major Sites, by State—1990

	ALL SITES*	MAJOR SITES								
STATE	Number of Cases	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Melanoma	Pancreas	Leukemia
Alabama	18,300	2,200	2,500	2,900	550	850	1,900	450	500	475
Alaska	1,100	175	125	200	30	50	75	40	25	40
Arizona	13,700	1,800	1,800	2,000	300	550	1,500	350	375	375
Arkansas	11,300	1,300	1,500	1,900	275	400	1,000	325	325	300
California	105,000	15,100	14,500	15,400	3,300	4,700	10,400	3,500	2,900	2,900
Colorado	9,700	1,600	1,500	1,300	200	400	1,000	375	275	275
Connecticut	14,800	2,400	2,300	2,000	450	700	1,500	375	450	350
Delaware	3,000	475	400	475	70	125	325	90	60	90
Dist. of Columbia	3,300	400	500	450	175	175	475	90	80	90
Florida	68,000	9,300	10,500	11,100	2,400	2,500	7,800	1,900	1,800	1,700
Georgia	24,000	3,300	3,100	3,900	900	1,100	2,700	650	550	600
Hawaii	3,400	425	550	450	175	175	325	80	90	100
Idaho	3,500	450	475	450	80	175	475	125	125	100
Illinois	49,700	7,500	8,000	7,400	1,200	2,500	4,700	950	1,400	1,300
Indiana	24,400	3,200	3,900	3,900	650	1,100	2,400	550	650	650
Iowa	12,900	1,800	2,300	1,900	475	600	1,500	275	400	300
Kansas	10,200	1,600	1,600	1,500	250	550	1,100	250	300	325
Kentucky	16,800	2,200	2,400	3,000	400	750	1,600	375	375	425
Louisiana	18,600	2,200	2,600	3,000	600	950	1,800	350	500	400
Maine	5,700	750	950	800	200	300	600	100	150	150
Maryland	20,000	2,900	2,800	3,000	550	750	1,900	500	500	450
Massachusetts	28,400	4,800	4,400	4,000	700	1,300	2,600	750	800	750
Michigan	37,900	5,700	5,300	5,600	1,100	1,600	3,700	750	1,100	1,100
Minnesota	16,900	2,600	2,600	2,100	450	700	2,000	400	500	550
Mississippi	11,000	1,300	1,400	1,700	350	500	1,300	250	300	300
Missouri	23,500	3,200	3,600	3,700	650	1,000	2,200	600	650	650
Montana	3,300	475	475	425	80	200	450	90	100	100
Nebraska	6,700	950	1,100	1,000	125	300	700	225	175	200
Nevada	4,400	550	550	800	150	125	325	125	125	100
New Hampshire	4,700	700	750	650	100	250	425	125	150	125
New Jersey	37,700	5,900	6,200	5,400	1,200	1,600	3,700	1,000	950	950
New Mexico	4,700	650	650	600	100	175	550	100	150	150
New York	80,000	13,000	13,600	10,900	2,600	3,700	7,900	2,300	2,300	2,000
North Carolina	26,000	4,200	3,700	4,200	800	1,100	2,800	750	700	650
North Dakota	2,800	400	450	350	70	150	425	60	90	125
Ohio	49,000	7,200	7,800	7,700	1,400	2,300	4,600	1,100	1,300	1,200
Oklahoma	14,300	1,800	2,000	2,500	350	750	1,500	475	400	425
Oregon	12,300	1,600	1,700	2,100	325	500	1,500	325	325	350
Pennsylvania	61,000	8,800	9,800	8,800	1,500	2,800	5,800	1,600	1,500	1,700
Rhode Island	5,200	900	800	750	200	250	550	150	150	125
South Carolina	13,200	1,800	1,700	2,000	600	800	1,700	425	375	350
South Dakota	3,200	450	600	425	80	125	450	100	80	100
Tennessee	21,100	2,700	2,700	3,600	600	1,000	2,000	550	550	600
Texas	55,600	7,700	7,100	8,600	1,600	2,500	5,200	1,600	1,400	1,600
Utah	3,600	550	550	350	80	200	500	100	100	150
Vermont	2,300	400	325	325	60	125	275	75	75	80
Virginia	24,500	3,600	3,500	4,100	700	950	2,400	650	600	650
Washington	18,000	2,600	2,600	2,800	550	750	2,000	500	500	450
West Virginia	9,600	1,100	1,400	1,700	225	450	900	225	225	225
Wisconsin	20,300	3,100	3,200	2,600	500	850	2,300	450	550	600
Wyoming	1,400	200	150	200	25	50	175	50	50	50
United States	1,040,000	150,000	155,000	157,000	30,500	46,500	106,000	27,600	28,100	27,800
Puerto Rico	7,000	900	650	500	450	400	850	60	175	200

*Does not inciude carcinoma in situ or nonmelanoma skin cancer.

These estimates are offered as a rough guide and should not be regarded as definitive. They are calculated according to the distribution of estimated 1990 cancer deaths by state. Especially note that year-to-year changes may only represent improvements in the basic data.

CANCER DEATHS—1990

Estimated Cancer Deaths for All Sites Plus Major Sites, by State—1990

	ALL SITES		MAJOR SITES								
STATE	Number of Deaths	Death Rate per 100,000 Population*	Female Breast	Colon & Rectum	Lung	Oral	Uterus	Prostate	Skin Mela-noma	Pancreas	Leukemia
Alabama	9,000	175	650	1,000	2,700	150	175	550	100	450	300
Alaska	500	190	40	50	175	10	10	15	10	20	25
Arizona	6,700	153	550	700	1,800	80	100	425	80	350	250
Arkansas	5,600	165	375	600	1,800	75	90	300	70	275	200
California	51,200	168	4,500	5,700	13,900	900	1,000	2,900	800	2,600	1,900
Colorado	4,700	144	475	600	1,200	60	80	275	80	250	175
Connecticut	7,200	173	700	900	1,800	125	150	400	90	400	225
Delaware	1,500	190	150	150	400	25	25	90	20	50	60
Dist. of Columbia	1,700	220	125	200	375	50	40	125	20	60	60
Florida	33,400	162	2,700	4,100	10,000	650	500	2,100	450	1,600	1,100
Georgia	11,500	171	1,000	1,200	3,500	250	250	750	150	500	400
Hawaii	1,700	140	125	200	400	50	30	100	20	80	60
Idaho	1,800	146	125	175	400	30	40	150	30	100	60
Illinois	24,500	176	2,200	3,100	6,700	350	550	1,300	225	1,200	850
Indiana	12,000	176	950	1,500	3,600	175	250	700	125	600	425
Iowa	6,400	158	500	900	1,700	125	125	400	60	350	250
Kansas	5,000	152	475	650	1,300	60	125	325	60	275	200
Kentucky	8,300	180	650	950	2,800	100	150	450	80	325	275
Louisiana	9,100	186	650	1,000	2,700	175	225	500	90	450	250
Maine	2,800	179	225	375	750	60	70	175	20	125	100
Maryland	9,800	194	850	1,100	2,700	150	175	550	125	475	300
Massachusetts	14,000	179	1,400	1,700	3,600	200	275	750	175	700	475
Michigan	18,600	176	1,700	2,100	5,100	300	350	1,100	175	950	700
Minnesota	8,300	154	800	1,000	1,900	125	150	550	90	475	375
Mississippi	5,300	166	375	550	1,600	90	100	375	50	275	200
Missouri	11,600	170	950	1,400	3,300	175	225	650	125	600	400
Montana	1,600	160	125	200	400	30	40	125	20	90	70
Nebraska	3,300	154	275	425	900	30	60	200	50	150	150
Nevada	2,200	182	150	225	700	40	25	90	30	100	70
New Hampshire	2,200	177	200	300	600	30	50	125	30	125	90
New Jersey	18,500	185	1,700	2,400	4,900	325	350	1,000	225	850	600
New Mexico	2,300	145	200	250	550	30	40	150	30	125	100
New York	39,000	177	3,800	5,400	9,900	700	800	2,200	500	2,000	1,300
North Carolina	12,600	164	1,200	1,400	3,800	200	250	800	175	650	425
North Dakota	1,400	151	125	175	325	20	30	125	10	80	75
Ohio	24,200	182	2,100	3,100	6,900	375	500	1,300	250	1,100	800
Oklahoma	7,000	165	500	800	2,200	100	150	425	100	350	275
Oregon	6,000	165	500	650	1,900	90	100	425	75	300	225
Pennsylvania	30,000	178	2,600	3,900	7,900	425	600	1,700	375	1,300	1,100
Rhode Island	2,600	181	275	325	650	60	60	150	30	125	80
South Carolina	6,500	169	500	700	1,800	150	175	475	100	350	250
South Dakota	1,600	152	125	225	400	20	30	150	25	70	70
Tennessee	10,400	170	800	1,100	3,300	150	225	600	125	500	375
Texas	27,300	158	2,200	2,800	7,700	425	550	1,500	375	1,300	1,000
Utah	1,800	122	150	200	300	20	40	150	25	90	100
Vermont	1,200	176	125	125	300	20	30	80	20	70	50
Virginia	12,000	189	1,000	1,400	3,700	200	200	700	125	550	400
Washington	8,800	164	800	1,000	2,600	150	150	550	125	450	300
West Virginia	4,600	174	350	550	1,500	60	100	275	50	200	150
Wisconsin	10,000	162	900	1,300	2,400	150	175	650	100	500	400
Wyoming	700	146	60	50	175	10	10	50	10	40	30
United States	510,000	171	44,000	60,900	142,000	8,350	10,000	30,000	6,300	25,000	18,100
Puerto Rico	4,000	130	250	350	550	175	150	325	25	175	150

*Average annual mortality rate for 1982-86, adjusted to the age distribution of the 1970 US Census Population.

ESTIMATED NEW CANCER CASES AND DEATHS BY SEX FOR ALL SITES—1990*

	ESTIMATED NEW CASES			ESTIMATED DEATHS		
	Total	Male	Female	Total	Male	Female
ALL SITES	1,040,000*	520,000*	520,000*	510,000	270,000	240,000
Buccal Cavity & Pharynx (**ORAL**)	30,500	20,400	10,100	8,350	5,575	2,775
Lip	3,600	3,100	500	100	75	25
Tongue	6,100	3,900	2,200	1,950	1,300	650
Mouth	11,500	6,900	4,600	2,500	1,500	1,000
Pharynx	9,300	6,500	2,800	3,800	2,700	1,100
Digestive Organs	236,800	121,300	115,500	122,900	64,600	58,300
Esophagus	10,600	7,400	3,200	9,500	7,000	2,500
Stomach	23,200	13,900	9,300	13,700	8,300	5,400
Small Intestine	2,800	1,500	1,300	900	500	400
Large Intestine } (**COLON-RECTUM**)	110,000	52,000	58,000	53,300	26,000	27,300
Rectum }	45,000	24,000	21,000	7,600	4,000	3,600
Liver & Biliary Passages	14,600	7,700	6,900	11,900	6,200	5,700
Pancreas	28,100	13,600	14,500	25,000	12,100	12,900
Other & Unspecified Digestive	2,500	1,200	1,300	1,000	500	500
Respiratory System	173,700	115,000	58,700	147,100	95,900	51,200
Larynx	12,300	10,000	2,300	3,750	3,000	750
LUNG	157,000	102,000	55,000	142,000	92,000	50,000
Other & Unspecified Respiratory	4,400	3,000	1,400	1,350	900	450
Bone	2,100	1,200	900	1,100	600	500
Connective Tissue	5,700	3,000	2,700	3,100	1,500	1,600
SKIN	27,600†	14,800†	12,800†	8,800§	5,700	3,100
BREAST	150,900‡	900‡	150,000‡	44,300	300	44,000
Genital Organs	185,000‡	113,100	71,900‡	54,100	30,600	23,500
Cervix Uteri } (**UTERUS**)	13,500‡	—	13,500‡	6,000	—	6,000
Corpus, Endometrium }	33,000	—	33,000	4,000	—	4,000
Ovary	20,500	—	20,500	12,400	—	12,400
Other & Unspecified Genital, Female	4,900	—	4,900	1,100	—	1,100
Prostate	106,000	106,000	—	30,000	30,000	—
Testis	5,900	5,900	—	350	350	—
Other & Unspecified Genital, Male	1,200	1,200	—	250	250	—
Urinary Organs	73,000	51,000	22,000	20,000	12,600	7,400
Bladder	49,000	36,000	13,000	9,700	6,500	3,200
Kidney & Other Urinary	24,000	15,000	9,000	10,300	6,100	4,200
Eye	1,700	900	800	300	150	150
Brain & Central Nervous System	15,600	8,500	7,100	11,100	6,000	5,100
Endocrine Glands	13,600	4,000	9,600	1,750	775	975
Thyroid	12,100	3,200	8,900	1,025	375	650
Other Endocrine	1,500	800	700	725	400	325
Leukemia	27,800	15,700	12,100	18,100	9,800	8,300
Lymphocytic Leukemia	11,600	6,700	4,900	5,200	3,000	2,200
Granulocytic Leukemia	11,500	6,300	5,200	7,600	4,000	3,600
Other & Unspecified Leukemia	4,700	2,700	2,000	5,300	2,800	2,500
Other Blood & Lymph Tissues	54,800	28,900	25,900	28,700	14,900	13,800
Hodgkin's Disease	7,400	4,200	3,200	1,600	1,000	600
Non-Hodgkin's Lymphomas	35,600	18,600	17,000	18,200	9,500	8,700
Multiple Myeloma	11,800	6,100	5,700	8,900	4,400	4,500
All Other & Unspecified Sites	41,200	21,300	19,900	40,300	21,000	19,300

NOTE: The estimates of new cancer cases are offered as a rough guide and should not be regarded as definitive. Especially note that year-to-year changes may only represent improvements in the basic data. ACS six major sites appear in boldface caps.

*Carcinoma in situ and nonmelanoma skin cancers are not included in totals. Carcinoma in situ of the uterine cervix accounts for more than 50,000 new cases annually, carcinoma in situ of the female breast accounts for about 15,000 new cases annually, and melanoma carcinoma in situ accounts for about 5,000 new cases annually. Overall, about 100,000 new cases of carcinoma in situ of all sites of cancer are diagnosed each year. Nonmelanoma skin cancer accounts for about 600,000 new cases annually.

†Melanoma only. ‡Invasive cancer only. §Melanoma 6,300; other skin 2,500.

INCIDENCE ESTIMATES ARE BASED ON RATES FROM NCI SEER PROGRAM 1984-86.

SELECTED CANCER SITES

LUNG CANCER

Incidence: An estimated 157,000 new cases in 1990. The incidence rate, which had been increasing steadily in men and women for several decades, has begun to decline in men from a high of 86.5 per 100,000 in 1984 to 81.9 in 1986. The incidence rate in women continues to increase, to a high of 36.4 per 100,000 in 1986.

Mortality: An estimated 142,000 deaths in 1990. In 1987, for the first time, more women died of lung cancer than breast cancer which for over 50 years was the major cause of cancer death in women.

Warning Signals: Persistent cough, sputum streaked with blood, chest pain, recurring pneumonia or bronchitis.

Risk Factors: Cigarette smoking; history of smoking 20 or more years; exposure to certain industrial substances, such as arsenic, certain organic chemicals and asbestos, particularly for persons who smoke; radiation exposure from occupational, medical, and environmental sources. Residential radon exposure may increase risk, especially in cigarette smokers. Exposure to sidestream cigarette smoke increases the risk for nonsmokers.

Early Detection: Because symptoms often don't appear until the disease is in advanced stages, early detection is very difficult. In smokers who stop smoking at the time of early precancerous cellular changes, damaged bronchial lining tissues often return to normal. Smokers who persist in smoking may form abnormal cell growth patterns that lead to cancer. Chest x-ray, analysis of the types of cells contained in sputum, and fiberoptic examination of the bronchial passages assist diagnosis.

Treatment: Determined by the type and stage of the cancer. Options include surgery, radiation therapy, and chemotherapy. For many localized cancers, surgery is usually the treatment of choice. Because the disease has usually spread by the time it is discovered, radiation therapy and chemotherapy are often needed in combination with surgery. In small cell cancer, chemotherapy alone or combined with radiation has replaced surgery as the treatment of choice; on this regimen, a large percentage of patients experience remission, which in some cases is long-lasting.

Survival: The 5-year relative survival rate is only 13% in all patients, regardless of stage at diagnosis. The rate is 36% for cases detected when the disease is still localized, but only 21% of lung cancers are discovered that early. Rates have improved only slightly over a recent 10-year period.

COLON AND RECTUM CANCER

Incidence: An estimated 155,000 new cases in 1990, including 110,000 of colon cancer and 45,000 of rectum cancer. The combined incidence is second only to that of lung cancer (excluding common skin cancers).

Mortality: An estimated 60,900 deaths (53,300 from colon cancer; 7,600 from rectum cancer) in 1990, second only to lung cancer.

Warning Signals: Rectal bleeding, blood in the stool, change in bowel habits.

Risk Factors: Personal or family history of cancer or polyps of the colon or rectum; inflammatory bowel disease. High-fat and/or low-fiber diet may be a significant causative factor.

Early Detection: Digital rectal examination, stool blood slide test, and proctosigmoidoscopy are recommended by the American Cancer Society to detect colon or rectum cancer in asymptomatic patients.

Digital rectal examination is performed by a physician during an office visit. The American Cancer Society recommends that this examination be performed annually after age 40.

The stool blood slide test is a simple method to test feces for hidden blood. The specimen is obtained by the patient at home and returned to the physician's office, a hospital, or a clinic for analysis. The Society recommends annual testing after age 50.

In proctosigmoidoscopy, the physician uses a hollow lighted tube to inspect the rectum and lower colon. The site of most colorectal cancers appears to be shifting higher in the colon; for this reason, longer, flexible instruments are being used, as well as a rigid scope. The American Cancer Society recommends the use of this examination every 3 to 5 years after age 50, on the advice of a physician.

If any of these tests reveal possible problems, more extensive studies, such as colonoscopy (examination of the entire colon) and barium enema (an x-ray procedure in which the intestines are viewed), may be needed.

Treatment: Surgery, at times combined with radiation, is the most effective method of treating colorectal cancer. The role of chemotherapy in treating advanced cases is under study.

Colostomy (creation of an abdominal opening for elimination of body wastes) is seldom needed for colon cancer patients and is infrequently required for rectal cancer patients. One study has shown that as few as 15% of patients whose rectal cancers are detected early require permanent colostomies. The American Cancer Society has a special patient assistance program for those who do have permanent colostomies (see p. 24).

Survival: When colorectal cancer is detected in an early, localized stage, the 5-year survival rates are 87% for colon cancer and 79% for rectal cancer. After the cancer has spread regionally, to involve adjacent organs or lymph nodes, the survival rates drop to 58% and 46%, respectively. Survival rates for persons with distant metastases are less than 6%.

SELECTED CANCER SITES

BREAST CANCER

Incidence: An estimated 150,900 new cases in the United States during 1990. Approximately one of every 10 women will develop breast cancer at some time. Breast cancer occurs rarely in men. Breast cancer incidence rates have increased about 1% a year since the early 1970s, and have gone from 84.7 per 100,000 in 1980 to 104.9 in 1986. Some of this increase is believed to be due to screening programs detecting tumors before they become clinically apparent. Other reasons for the increase are not fully understood.

Mortality: An estimated 44,300 deaths (44,000 females; 300 males) in 1990; in women, the second major cause of cancer death. Although incidence rates are increasing, early detection and improved treatment have kept mortality rates fairly stable over the past 50 years.

Warning Signals: Breast changes that persist, such as a lump, thickening, swelling, dimpling, skin irritation, distortion, retraction or scaliness of the nipple, nipple discharge, pain, or tenderness.

Risk Factors: Over age 50; personal or family history of breast cancer; never had children; first childbirth after age 30.

Early Detection: The American Cancer Society recommends monthly breast self-examination as a routine good health habit for women 20 years or older. Most breast lumps are not cancer, but only a physician can make a diagnosis.

The American Cancer Society and the National Cancer Institute, in their joint Breast Cancer Detection Demonstration program, found that mammography (x-ray examination using a low level of radiation) can reveal cancers too small to be felt by the most experienced examiner.

Besides its effectiveness in screening women without symptoms, mammography is recognized as a valuable diagnostic technique for women who do have findings suggestive of breast cancer. Once a breast lump is found, mammography can help determine if there are other lesions too small to be felt, in the same or opposite breast. All suspicious lumps should be biopsied for a definitive diagnosis, even when the mammography findings are described as normal.

The Society recommends a mammogram every year for asymptomatic women age 50 and over, and a baseline mammogram for those 35 to 39. Asymptomatic women 40 to 49 should have mammography every 1-2 years. In addition, a professional physical examination of the breast is recommended every three years for women 20 to 40, and every year for those over 40.

Treatment: Taking into account the medical situation and the patient's preferences, treatment may require lumpectomy (local removal of the tumor), mastectomy (surgical removal of the breast), radiation therapy, chemotherapy, or hormone manipulation therapy. Often, two or more methods are used in combination. Patients should discuss with their physicians possible options for the best management of their breast cancer.

New techniques in recent years have made breast reconstruction possible after mastectomy, and the cosmetic results are good. Reconstruction has become an important part of treatment and rehabilitation (see p. 24).

Survival: The 5-year survival rate for localized breast cancer has risen from 78% in the 1940s to 90% today. If the breast cancer is in situ (not invasive), the survival rate approaches 100%. If the cancer has spread regionally, however, the survival rate is 68%; for persons with distant metastases, the survival rate is 18%.

UTERINE CANCER

Incidence: An estimated 46,500 new invasive cases in 1990, including 13,500 cases of cancer of the cervix and 33,000 cases of cancer of the body of the uterus, usually of the endometrium (lining). The incidence of invasive cervical cancer has steadily decreased over the years. Carcinoma in situ rates have risen slightly in women under 50 in recent years. Cervical cancer is most common today among women of low socioeconomic groups, but all women are at risk. Endometrial cancer afflicts mostly mature women, and diagnosis usually is made after age 50

Mortality: An estimated 6,000 deaths in 1990 from cervical cancer and 4,000 from endometrial cancer. Overall, the death rate for uterine cancer has decreased more than 70% over the past 40 years, due mainly to the Pap test and regular checkups.

Warning Signals: Bleeding outside of the normal menstrual period or after menopause, or unusual vaginal discharge.

Risk Factors: For cervical cancer: early age at first intercourse, multiple sex partners, cigarette smoking, and certain sexually transmitted diseases. For endometrial cancer: history of infertility, failure to ovulate, prolonged estrogen therapy, obesity.

Early Detection: The Pap test is a valuable simple procedure that can be performed at appropriate intervals by physicians as part of a pelvic examination. A small sample of cells is swabbed from the cervix and body of the uterus, transferred to a slide, and examined under a microscope. This test should be performed annually with a pelvic examination in women who are or have been sexually active or who have reached age 18 years. After three or more consecutive annual examinations with normal findings, the Pap test may be performed less frequently at the discretion of the physician.

The Pap test is highly effective in detecting early cancer of the uterine cervix; it is only partially effective in detecting endometrial cancer. Women at high risk of developing endometrial cancer should have an endometrial tissue sample evaluated at menopause.

During menopause, there is a decline in the level of

SELECTED CANCER SITES

hormones (estrogens) normally produced by the ovaries. This causes symptoms such as "hot flashes" or thinning of the vaginal lining (the latter can make sexual intercourse painful). To control these symptoms, estrogen replacement therapy is given to women during and after menopause. Certain risks associated with such treatment include increased risk of endometrial cancer. The benefits and risks of such treatment should be carefully discussed by the woman and her physician.

Treatment: Uterine cancers generally are treated by surgery or radiation, or by a combination of the two. In precancerous (in situ) stages, changes in the cervix may be treated by cryotherapy (the destruction of cells by extreme cold), by electrocoagulation (the destruction of tissue through intense heat by electric current), or by local surgery. Precancerous endometrial changes may be treated with the hormone progesterone.

Survival: The 5-year survival rate for all cervical cancer patients is 67%. For patients diagnosed early, however, the survival rate is 88%, and if the disease is in situ, the rate is virtually 100%. In endometrial cancer, survival rates are 85% overall, 92% if discovered at an early stage, and virtually 100% if discovered at the precancerous lesion stage. During a recent 10-year period, there was moderate improvement of survival rates for each site.

OVARIAN CANCER

Incidence: An estimated 20,500 new cases in the United States in 1990. It is estimated that one of every 70 women (approximately 1.4%) will develop ovarian cancer during her lifetime. It accounts for 4% of all cancers among women.

Mortality: An estimated 12,400 deaths in 1990. Although ovarian cancer ranks second in incidence among gynecological cancers, it causes more deaths than any other cancer of the female reproductive system.

Warning Signals: Ovarian cancer is often "silent," showing no obvious signs or symptoms until late in its development. The most common sign is enlargement of the abdomen, which is caused by the accumulation of fluid. Rarely will there be abnormal vaginal bleeding. In women over 40, vague digestive disturbances (stomach discomfort, gas, distention) that persist and cannot be explained by any other cause may indicate the need for a thorough evaluation for ovarian cancer.

Risk Factors: Risk for ovarian cancer increases with age. The highest rates are for women over 60. Women who have never had children are twice as likely to develop ovarian cancer as those who have. A number of interrelated reproductive factors, such as age at first live birth, age at first pregnancy, and number of pregnancies are all involved in varying degrees. If a woman has breast or endometrial cancer, her chances of developing ovarian cancer double. Patients with colorectal cancer are at increased risk of ovarian cancer, but risk decreases over time following diagnosis of the colorectal cancer. Certain rare genetic disorders are associated with increased risk. Incidence rates are higher in North America and northern Europe and are lower in Asia and Africa. Rates are significantly higher for Jewish women, and women who have never married.

Early Detection: Periodic, thorough pelvic examinations are important. *The Pap test, useful in detecting cervical cancer, does not reveal ovarian cancer.* Women over the age of 40 should have a cancer-related checkup every year.

Treatment: Surgery, radiation therapy, and drug therapy are treatment options. Surgical treatment usually includes the removal of one or both ovaries (oophorectomy), the uterus (hysterectomy), and the fallopian tubes (salpingectomy). In some very early tumors, it is possible that only the involved ovary will be removed, especially in young women. In advanced disease, an attempt is made to remove all intraabdominal disease, to enhance the effect of chemotherapy.

Survival: Overall, the 5-year survival rate for ovarian cancer is 38%. If diagnosed and treated early, the relative survival rate is 85%. Survival rates for women with regional and distant disease are 45% and 18%, respectively. Modern chemotherapeutic agents have improved the survival rate.

ORAL CANCER

Incidence: An estimated 30,500 new cases in 1990. Incidence is more than twice as high in men as in women, and is most frequent in men over age 40.

Mortality: An estimated 8,350 deaths in 1990.

Warning Signals: A sore that bleeds easily and doesn't heal; a lump or thickening; a red or white patch that persists. Difficulty in chewing, swallowing, or moving tongue or jaws are often late changes.

Risk Factors: Cigarette, cigar, or pipe smoking; use of smokeless tobacco; excess use of alcohol.

Early Detection: Cancer can affect any part of the oral cavity, including the lip, tongue, mouth, and throat. Dentists and primary care physicians have the opportunity, during regular checkups, to see abnormal tissue changes and to detect cancer at an early, curable stage.

Treatment: Principal methods are radiation therapy and surgery. Chemotherapy is being studied as an adjunct to surgery in advanced disease.

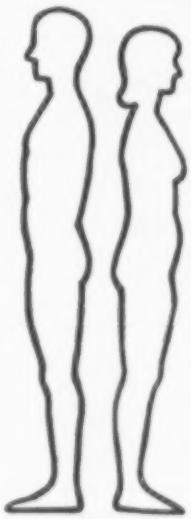
Survival: Five-year survival rates vary substantially, depending on the site. Rates range from 32% for cancer of the pharynx to 92% for lip cancer. Overall, 5-year survival for oral cancer patients is about 52%.

SELECTED CANCER SITES

CANCER INCIDENCE AND DEATHS BY SITE AND SEX—1990 ESTIMATES

CANCER INCIDENCE BY SITE AND SEX*

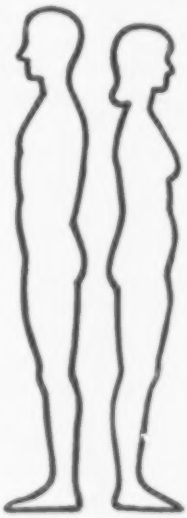
Male		Female	
PROSTATE	106,000	BREAST	150,000
LUNG	102,000	COLON & RECTUM	79,000
COLON & RECTUM	76,000	LUNG	55,000
BLADDER	36,000	UTERUS	46,500
LYMPHOMAS	22,800	OVARY	20,500
ORAL	20,400	LYMPHOMAS	20,200
LEUKEMIAS	15,700	PANCREAS	14,500
KIDNEY	15,000	BLADDER	13,000
MELANOMA OF THE SKIN	14,800	MELANOMA OF THE SKIN	12,800
STOMACH	13,900	LEUKEMIAS	12,100
PANCREAS	13,600	ORAL	10,100
LARYNX	10,000	STOMACH	9,300



*Excluding nonmelanoma skin cancer and carcinoma in situ.

CANCER DEATHS BY SITE AND SEX

Male		Female	
LUNG	92,000	LUNG	50,000
PROSTATE	30,000	BREAST	44,000
COLON & RECTUM	30,000	COLON & RECTUM	30,900
PANCREAS	12,100	PANCREAS	12,900
LYMPHOMAS	10,500	OVARY	12,400
LEUKEMIAS	9,800	UTERUS	10,000
STOMACH	8,300	LYMPHOMAS	9,300
ESOPHAGUS	7,000	LEUKEMIAS	8,300
BLADDER	6,500	LIVER	5,700
LIVER	6,200	STOMACH	5,400
KIDNEY	6,100	BRAIN	5,100
BRAIN	6,000	MULTIPLE MYELOMA	4,500



PROSTATE CANCER

Incidence: An estimated 106,000 new cases in the United States during 1990. Approximately one of every 11 men will develop prostate cancer. This is the second most common cancer in men, after skin cancer.

Mortality: An estimated 30,000 deaths in 1990, the second leading cause of cancer deaths in men.

Warning Signals: Weak or interrupted flow of urine; inability to urinate, or difficulty starting or stopping the urine flow; the need to urinate frequently, especially at night; blood in the urine; pain or burning on urination; continuing pain in lower back, pelvis, or upper thighs. Most of these symptoms are nonspecific and may be similar to benign conditions such as infection or prostate enlargement.

Risk Factors: Incidence increases with age through the most advanced ages; over 80% of all prostate cancers are diagnosed in men over the age of 65. The disease is more common in northwestern Europe and North America. It is rare in the Near East, Africa, Central America, and South America. For reasons not currently known, black Americans have the highest incidence rate in the world. There is some familial association, but it is unclear whether this is due to genetic or environmental factors. Studies conducted internationally have shown that dietary fat may be a factor. Workers who are exposed to cadmium are at slightly higher risk.

Early Detection: Every man over 40 should have a rectal examination as part of his regular annual physical checkup. A new technique, prostate ultrasound, may reveal cancers too small to be detected by physical examination. This new approach may be of special benefit to men who are at high risk. Men over 40 should be alert to the signs and symptoms and should see their physician immediately should any occur. The key to saving lives is early detection.

Treatment: Surgery, alone or in combination with radiation and/or hormones, and anticancer drugs, are treatment options. Hormone treatment and anticancer drugs also may control prostate cancer for long periods by shrinking the size of the tumor, thus greatly relieving pain.

Survival: Sixty percent of all prostate cancers are discovered while still localized; the 5-year relative survival rate for patients whose tumors are diagnosed at this stage is 84%. Survival rates for all stages combined have steadily improved since 1940, and in the past 20 years have increased from 48% to 70%.

SELECTED CANCER SITES

BLADDER CANCER

Incidence: An estimated 49,000 new cases of bladder cancer in 1990; 36,000 in men, 13,000 in women. Bladder cancers account for 7% of the new cancer cases diagnosed each year in men and 3% in women. Bladder cancer is the fifth most common form of cancer in men and the ninth most common form of cancer in women in this country.

Mortality: An estimated 9,700 deaths in 1990 from bladder cancers, the ninth leading cause of cancer deaths in men and fourteenth in women.

Warning Signals: Blood in the urine. Usually associated with increased frequency of urination.

Risk Factors: Smoking is the greatest risk factor in bladder cancer, with smokers experiencing twice the risk of nonsmokers. Smoking is estimated to be responsible for approximately 47% of the bladder cancer deaths among men and 37% among women. Overall, the incidence rate of bladder cancer is four times greater among men than among women, and is higher in whites than in blacks. People living in urban areas and workers exposed to dye, rubber, or leather also are at higher risk.

Diagnosis: Bladder cancer is diagnosed by examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that can be inserted into the tract through the urethra.

Treatment: Surgery, alone or in combination with other treatments is used in 92% of cases.

Survival: When detected at an early stage, the 5-year survival rate for bladder cancer is 87%. For regional and distant disease the survival rates are 43% and 9%, respectively.

SKIN CANCER

Incidence: Over 600,000 cases a year, the vast majority of which are highly curable basal cell or squamous cell cancers. They are more common among individuals with lightly pigmented skin who live at latitudes near the equator. The most serious skin cancer is melanoma, which will be diagnosed in about 27,600 persons in 1990. The incidence of melanoma is increasing at the rate of 4% per year.

Mortality: An estimated 8,800 deaths this year, 6,300 from malignant melanoma and 2,500 due to other skin cancers.

Warning Signals: Any unusual skin condition, especially a change in the size or color of a mole or other darkly pigmented growth or spot. Scaliness, oozing, bleeding, or change in the appearance of a bump or nodule, the spread of pigmentation beyond its border, a change in sensation, itchiness, tenderness, or pain are all warning signs of melanoma.

Risk Factors: Excessive exposure to the sun; fair complexion; occupational exposure to coal tar, pitch, creosote, arsenic compounds, or radium. Among blacks, because of heavy skin pigmentation, skin cancer incidence is very low.

Prevention: The sun's ultraviolet rays are strongest between 10 a.m. and 3 p.m. Exposure at these times should be avoided, and protective clothing should be worn. Sunscreens should be used. These come in various strengths, ranging from those facilitating gradual tanning to those that allow practically no tanning. Because of the possible link between severe sunburn in childhood and greatly increased risk of melanoma in later life, children, in particular, should be protected from traumatic sunburns.

Early Detection: Early detection is critical. Recognition of changes in skin growths or the appearance of new growths is the best way to find early skin cancer. Adults should practice skin self-examination once a month, and suspicious lesions should be evaluated promptly by a physician. Basal and squamous cell skin cancers often take the form of a pale, waxlike, pearly nodule, or a red, scaly, sharply outlined patch. A sudden or progressive change in a mole's appearance should be checked by a physician. Melanomas often start as small, mole-like growths that increase in size, change color, become ulcerated, and bleed easily from a slight injury. A simple **ABCD** rule outlines the warning signals of melanoma: **A is for asymmetry**. One half of the mole does not match the other half. **B is for border irregularity**. The edges are ragged, notched, or blurred. **C is for color**. The pigmentation is not uniform. **D is for diameter greater than 6 millimeters**. Any sudden or progressive increase in size should be of special concern.

Treatment: There are four methods of treatment: surgery (used in 90% of cases), radiation therapy, electrodessication (tissue destruction by heat), or cryosurgery (tissue destruction by freezing) for early skin cancer. For malignant melanoma, the primary growth must be adequately excised, and it may be necessary to remove nearby lymph nodes. Removal and microscopic examination of all suspicious moles is essential. Advanced cases of melanoma are treated according to the characteristics of the case.

Survival: For basal cell or squamous cell cancers, cure is highly likely if detected and treated early. Malignant melanoma can spread to other parts of the body quickly; however, when detected in its earliest stages, and with proper treatment, it is highly curable.

The overall 5-year survival rate for white patients with malignant melanoma is 81%, compared with 95% for patients with other types of skin cancer. The 5-year survival rate for localized malignant melanoma is 90%; survival rates for regional and distant disease are 56% and 14%, respectively.

SELECTED CANCER SITES

PANCREATIC CANCER

Incidence: An estimated 28,100 new cases in the United States in 1990.

Mortality: An estimated 25,000 deaths in 1990. Pancreatic cancer is the fifth leading cancer killer.From 1950-1985, pancreatic cancer death rates in the US rose 24%, to 10.2 deaths per 100,000 men. During the same period, death rates for women rose 32%, to 7.2 deaths per 100,000 women.

Warning Signals: Cancer of the pancreas is a "silent" disease, one that occurs without symptoms until it is in advanced stages.

Risk Factors: Risk increases with age after age 30, with the most cases occurring between ages 65 and 79. Smoking is a major risk factor; incidence is more than twice as high for smokers versus nonsmokers. Sex and race are factors; the disease is 30% more common in men, and occurs approximately 50% more frequently in black Americans than in white Americans. Some studies have suggested associations with chronic pancreatitis, diabetes, or cirrhosis, but these findings have not been confirmed. In countries where the diet is high in fat, the pancreatic cancer rates are higher.

Early Detection: At present, only a biopsy yields a certain diagnosis, and because of the "silent" course of the disease, the need for biopsy is likely to be obvious only after the disease has advanced. Researchers are focusing on ways to diagnose pancreatic cancer before it is so far advanced that it presents symptoms. Ultrasound imaging and computerized tomography (CT) scans are being tried.

Prevention: Very little is known about what causes the disease or how to prevent it.

Treatment: Surgery, radiation therapy, and anticancer drugs are treatment options, but have had little influence on the outcome. In 59% of cases, diagnosis is so late that none of these is used.

Survival: Only 3% of patients live more than 5 years after diagnosis. The 2% of patients whose cancers occur in the pancreas' insulin-producing cells, and not its duct cells, tend to live longer; approximately 30% of these patients live more than 3 years after diagnosis.

LEUKEMIA

Incidence: An estimated 27,800 new cases in 1990, approximately evenly divided into acute leukemia and chronic leukemia. Although it is often thought of as primarily a childhood disease, leukemia will strike many more adults (25,300 this year) than children (2,500 this year). Acute lymphocytic leukemia accounts for approximately 1,900 of the cases of leukemia among children. In adults, the most common types are acute granulocytic (approximately 6,700 cases annually) and chronic lymphocytic (8,000 cases annually).

Mortality: An estimated 18,100 deaths in 1990.

Warning Signals: Early signs may include fatigue, paleness, weight loss, repeated infections, bruising easily, and nosebleeds or other hemorrhages. In children, these symptoms can appear suddenly. Chronic leukemia can progress slowly and with few symptoms.

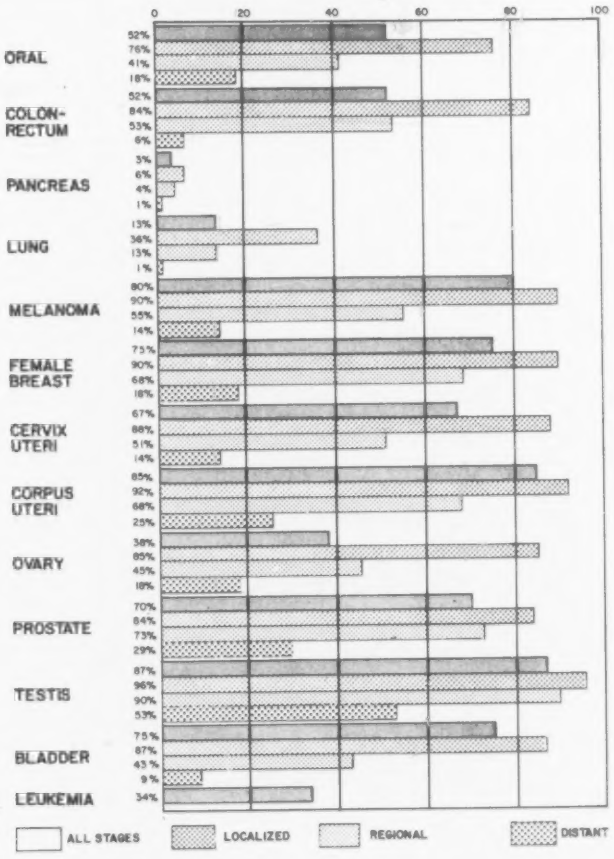
Risk Factors: Leukemia strikes both sexes and all ages. Causes of most cases are unknown. Persons with Down's Syndrome and certain other genetic abnormalities have higher than normal incidence of leukemia. It has also been linked to excessive exposure to ionizing radiation and to certain chemicals such as benzene, a toxic, commercially used substance that is also present in lead-free gasoline. Certain forms of leukemia and lymphoma are caused by newly discovered retrovirus, HTLV-1.

Early Detection: Because symptoms often appear to be those of other, less serious conditions, leukemia can be difficult to diagnose early. When a physician does suspect leukemia, diagnosis can be made using blood tests and biopsy of the bone marrow.

Treatment: Leukemia is a cancer of the bloodforming tissues. When leukemia occurs, millions of abnormal, immature white blood cells are released into the circulatory system. These abnormal cells crowd out normal white cells (which fight infection), platelets (which control hemorrhaging), and red blood cells (which prevent anemia). Chemotherapy, the most effective method of treating leukemia, kills the attacking abnormal cells. Transfusions of blood components and antibotics are used as supportive treatments. Today, continuing research at leading US medical centers is yielding new and better drugs for treating leukemia patients. Various anticancer drugs are used, either in combinations or as single agents. To prevent persistence of hidden cells, therapy of the central nervous system has become standard treatment, especially in acute lymphocytic leukemia. Under appropriate conditions, bone marrow transplantation may be useful in the treatment of certain leukemias.

Survival: The overall, 5-year survival rate for patients with leukemia is 34%, due partly to very poor survival of patients with some types of leukemia such as acute granulocytic. Over the last 30 years, however, there has been a dramatic improvement in survival of patients with acute lymphocytic leukemia: from a 5-year survival rate of 4% for people diagnosed in the early 1960s to 28% in the early 1970s to 48% around 1980. In children, the improvement has been from 4% to 71%. Moreover, in some medical centers, optimum treatment has raised survival of children with acute lymphocytic leukemia to as much as 75%. The American Cancer Society has long supported leukemia-related research; in 1988 alone, grants totaled almost $12 million. Over the past ten years, more than $120 million have been awarded in such grants.

FIVE-YEAR CANCER SURVIVAL RATES* FOR SELECTED SITES



*Adjusted for normal life expectancy.
This chart is based on cases diagnosed in 1974-1985.

Source: Cancer Statistics Branch,
National Cancer Institute.

HOW TO ESTIMATE CANCER STATISTICS LOCALLY

Community Population	Estimated No. Who Are Alive, Saved from Cancer	Estimated No. Cancer Cases Under Medical Care in 1990	Estimated No. Who Will Die of Cancer in 1990	Estimated No. of New Cases in 1990	Estimated No. Who Will Be Saved from Cancer in 1990	Estimated No. Who Will Eventually Develop Cancer	Estimated No. Who Will Die of Cancer if Present Rates Continue
1,000	13	14	2	4	2	300	220
2,000	26	28	4	8	4	600	440
3,000	39	42	6	12	6	900	660
4,000	52	56	8	16	8	1,200	880
5,000	65	70	10	20	10	1,500	1,100
10,000	130	140	20	40	20	3,000	2,200
25,000	325	350	50	100	50	7,500	5,500
50,000	650	700	100	200	100	15,000	11,000
100,000	1,300	1,400	200	400	200	30,000	22,000
200,000	2,600	2,800	400	800	400	60,000	44,000
500,000	6,500	7,000	1,000	2,000	1,000	150,000	110,000

NOTE: The figures are only a rough approximation of actual data for a community and should be used with caution. It is suggested that every effort be made to obtain actual data from a cancer registry source. Numbers may vary according to the age distribution of the local population.

CANCER BY AGE AND RACE

BLACK AMERICANS

A recent 14-year study of cancer rates showed that the cancer incidence rate for blacks is higher than for whites, and that the death rate is also higher. Over this period, black male cancer death rates rose by 15% compared with a 8% increase in black females. Incidence rates in blacks also have increased in both males and females.

The overall cancer incidence rate for blacks went up 15%, while for whites it increased 13%. Cancer mortality has increased in both races, but the rate for blacks is greater than for whites. The rates were virtually the same 30 years ago. Since then, cancer death rates in whites have increased 10%, while black rates have increased almost 50%.

Cancer sites where blacks had significantly higher increases in incidence and mortality rates included the lung, colon-rectum, prostate and esophagus. Esophageal cancer, long considered mainly a disease of males, remained about the same in whites and rose rapidly in blacks of both sexes.

The incidence of invasive cancer of the uterine cervix dropped in both black and white women, although the incidence in blacks is still double that in whites. However, the rate for endometrial cancer—or cancer of the body of the uterus—for white women is almost double that of black women.

Survival rates for patients diagnosed between 1974 and 1982 were compared for whites and blacks. More whites than blacks had cancer diagnosed in an early, localized stage when the chances of cure are best: 39% for whites versus 33% for blacks.

In a survey done for the ACS by the Gallup Organization in December 1987, the public's awareness and use of cancer tests was determined. The survey showed that 93% of white women knew of the Pap test and that 88% had had the test at some time, while 92% of black women knew of it and 79% had had it. For proctoscopic exams, 60% of the white population were aware of the procedure and 29% had had it at some time. For blacks, only 49% were aware of it and 22% had had it.

THE ECONOMICALLY DISADVANTAGED

A new ACS study has been started to evaluate the association of income with knowledge, attitudes, and behaviors related to cancer, and to do this while considering the effects of other important sociodemographic variables such as age, sex, ethnicity, and education. This study will rely on data from the 1987 National Health Interview Survey Cancer Control Supplement, and will examine the role of income in determining knowledge, attitudes, and behaviors pertaining to medical care, smoking, diet, screening, and health information.

HISPANIC-AMERICANS

A recent ACS-sponsored report described Hispanic attitudes toward cancer, cancer risk reduction and early detection. The study, conducted for the Society by the firm of Clark, Martire and Bartolomeo, Inc., underscored an urgent need for extensive cancer education and information programs directed to Hispanic-Americans. Survey findings showed that Hispanic-Americans are not adequately aware of most of the warning signals of cancer or of ways to reduce cancer risk, and that they tend not to seek early detection or treatment. The study identified the key psychological, cultural and economic barriers hindering the fight against cancer in the Hispanic-American community.

CHILDREN

Incidence: An estimated 7,600 new cases in 1990; as a childhood disease, cancer is rare. Common sites include the blood and bone marrow, bone, lymph nodes, brain, nervous system, kidneys, and soft tissues.

Mortality: An estimated 1,600 deaths in 1990, about one-third of them from leukemia. Despite its rarity, cancer is the chief cause of death by disease in children between the ages of 3 and 14. Mortality has declined from 8.3 per 100,000 in 1950 to 3.5 in 1986.

Early Detection: Cancers in children often are difficult to recognize. Parents should see that their children have regular medical checkups and be alert to any unusual symptoms that persist. These include: unusual mass or swelling; unexplained paleness and loss of energy; sudden tendency to bruise; persistent, localized pain or limping; prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden eye or vision changes; and excessive, rapid weight loss.

Some of the main childhood cancers are:

Leukemia: See preceding section.

Osteogenic Sarcoma and *Ewing's Sarcoma* are bone cancers. These may cause no pain at first, but swelling in the area of the tumor is often a first sign.

Neuroblastoma can appear anywhere but usually in the abdomen, where a swelling occurs.

Rhabdomyosarcoma, the most common soft tissue

CANCER BY AGE AND RACE

sarcoma, can occur in the head and neck area, genito-urinary area, trunk and extremities.

Brain Cancers in early stages may cause headaches, blurred or double vision, dizziness, difficulty in walking or handling objects, and nausea.

Lymphomas and *Hodgkin's Disease* are cancers that involve the lymph nodes, and also may invade bone marrow and other organs. They may cause swelling of lymph nodes in the neck, armpit or groin. Other symptoms may include general weakness and possibly fever.

Retinoblastoma, or an eye cancer, usually occurs in children under the age of four. When detected early, cure is possible with appropriate treatment.

Wilms' Tumor, a kidney cancer, may be recognized by a swelling or lump in the abdomen.

Treatment: Childhood cancers can be treated by a combination of therapies, coordinated by a team of experts. They include oncologic physicians, pediatric nurses, social workers, psychologists and others who assist children and their families.

Survival: Five-year survival rates vary considerably, depending on the site. Among those for white children: bone cancer, 51%; neuroblastoma, 55%; brain and central nervous system, 57%; Wilms' tumor (kidney), 81%; and Hodgkin's disease, 89%. (Data for black children are insufficient.)

TRENDS IN SURVIVAL BY SITE OF CANCER, BY RACE
Cases Diagnosed in 1960-63, 1970-73, 1974-76, 1977-79, 1980-85

	WHITE					BLACK				
	RELATIVE 5-YEAR SURVIVAL					RELATIVE 5-YEAR SURVIVAL				
SITE	1960-63[1]	1970-73[1]	1974-76[2]	1977-79[2]	1980-85[2]	1960-63[1]	1970-73[1]	1974-76[2]	1977-79[2]	1980-85[2]
All Sites	39%	43%	50%	50%	51%*	27%	31%	39%	38%	38%
Oral Cavity	45	43	55	53	54	–	–	36	36	31
Esophagus	4	4	5	6	8*	1	4	4	3	6
Stomach	11	13	14	16	16*	8	13	16	15	19
Colon	43	49	50	52	55*	34	37	45	47	48
Rectum	38	45	48	50	53*	27	30	41	38	39
Liver	2	3	4	3	4	–	–	1	4	2
Pancreas	1	2	3	2	3	1	2	2	4	5
Larynx	53	62	66	68	68	–	–	58	56	53
Lung & Bronchus	8	10	12	13	13*	5	7	11	11	12
Melanoma of Skin	60	68	79	81	81*	–	–	67†	37†	66
Breast (female)	63	68	75	75	76*	46	51	63	62	64
Cervix Uteri	58	64	69	68	67	47	61	63	61	59
Corpus Uteri	73	81	89	87	83*	31	44	62	57	52*
Ovary	32	36	36	37	38*	32	32	41	39	38
Prostate Gland	50	63	67	71	73*	35	55	58	62	63*
Testis	63	72	78	88	91*	–	–	77‡	–	91‡
Urinary Bladder	53	61	73	75	78*	24	36	47	54	56*
Kidney & Renal Pelvis	37	46	51	50	52	38	44	50	53	55
Brain & Nervous System	18	20	22	24	24*	19	19	28	28	30
Thyroid Gland	83	86	92	92	93	–	–	88	92	96
Hodgkin's Disease	40	67	72	73	76*	–	–	68‡	73	73
Non-Hodgkin's Lymphoma	31	41	47	48	51*	–	–	48	49	44
Multiple Myeloma	12	19	24	24	26*	–	–	28	32	29
Leukemia	14	22	34	36	34	–	–	30	30	27

Source: Cancer Statistics Branch, National Cancer Institute.

[1] Rates are based on End Results Group data from a series of hospital registries and one population-based registry.

[2] Rates are from the SEER Program. They are based on data from population-based registries in Connecticut, New Mexico, Utah, Iowa, Hawaii, Atlanta, Detroit, Seattle-Puget Sound and San Francisco-Oakland. Rates are based on follow-up of patients through 1986.

* The difference in rates between 1974-76 and 1980-85 is statistically significant ($p < 0.05$).

† The standard error of the survival rate is greater than 10 percentage points.

‡ The standard error of the survival rate is between 5 and 10 percentage points.

– Valid survival rate could not be calculated.

PREVENTION

PRIMARY PREVENTION REFERS TO STEPS THAT MIGHT BE TAKEN TO AVOID THOSE FACTORS THAT MIGHT LEAD TO THE DEVELOPMENT OF CANCER.

SMOKING	Cigarette smoking is responsible for 85% of lung cancer cases among men and 75% among women—about 83% overall. Smoking accounts for about 30% of all cancer deaths. Those who smoke two or more packs of cigarettes a day have lung cancer mortality rates 15 to 25 times greater than nonsmokers.
SUNLIGHT	Almost all of the more than 600,000 cases of non-melanoma skin cancer diagnosed each year in the US are considered to be sun-related. Recent epidemiologic evidence shows that sun exposure is a major factor in the development of melanoma and that the incidence increases for those living near the equator. (See Selected Cancer Sites: Skin Cancer.)
ALCOHOL	Oral cancer and cancers of the larynx, throat, esophagus, and liver occur more frequently among heavy drinkers of alcohol. (See Selected Cancer Sites: Oral Cancer.)
SMOKELESS TOBACCO	Use of chewing tobacco or snuff increases risk of cancer of the mouth, larynx, throat, and esophagus and is highly habit-forming. (See Selected Cancer Sites: Lung Cancer and Oral Cancer.)
ESTROGEN	For mature women, estrogen treatment to control menopausal symptoms increases risk of endometrial cancer. Use of estrogen by menopausal women needs careful discussion by the woman and her physician. (See Selected Cancer Sites: Uterine Cancer.)
RADIATION	Excessive exposure to ionizing radiation can increase cancer risk. Most medical and dental x-rays are adjusted to deliver the lowest dose possible without sacrificing image quality. Excessive radon exposure in homes may increase risk of lung cancer, especially in cigarette smokers. If levels are found to be too high, remedial actions should be taken.
OCCUPATIONAL HAZARDS	Exposure to several different industrial agents (nickel, chromate, asbestos, vinyl chloride, etc.) increases risk of various cancers. Risk from asbestos is greatly increased when combined with cigarette smoking.
NUTRITION	Risk for colon, breast, and uterine cancers increases in obese people. High-fat diets may contribute to the development of cancers of the breast, colon, and prostate. High-fiber foods may help reduce risk of colon cancer. A varied diet containing plenty of vegetables and fruits rich in vitamins A and C may reduce risk for a wide range of cancers. Salt-cured, smoked, and nitrite-cured foods have been linked to esophageal and stomach cancer. The heavy use of alcohol, especially when accompanied by cigarette smoking or chewing tobacco, increases risk of cancers of the mouth, larynx, throat, esophagus, and liver. (See above.)

SECONDARY PREVENTION REFERS TO STEPS TO BE TAKEN TO DIAGNOSE A CANCER OR PRECURSOR AS EARLY AS POSSIBLE AFTER IT HAS DEVELOPED.

COLORECTAL TESTS	The American Cancer Society recommends three tests for the early detection of colon and rectum cancer in people without symptoms. The digital rectal examination, performed by a physician during an office visit, should be performed every year after the age of 40; the stool blood test is recommended every year after 50; and the proctosigmoidoscopy examination should be carried out every 3 to 5 years, based on the advice of a physician. (See Selected Cancer Sites: Colon and Rectum Cancer.)
PAP TEST	For cervical cancer, women who are or have been sexually active, or have reached age 18 years, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician.
BREAST CANCER DETECTION	The American Cancer Society recommends the monthly practice of breast self-examination (BSE) by women 20 years and older as a routine good health habit. Physical examination of the breast should be done every three years from ages 20-40 and then every year. The ACS recommends a mammogram every year for asymptomatic women age 50 and over, and a baseline mammogram between ages 35 and 39. Women 40 to 49 should have mammography every 1-2 years, depending on physical and mammographic findings.

PREVENTION

CANCER-RELATED CHECKUP GUIDELINES

Guidelines for the early detection of cancer in people without symptoms are recommended by the American Cancer Society as follows:

A cancer-related checkup:

- every 3 years for those 20-40 years of age.
- every year for those 40 and over.

The Society advises that you talk with your doctor. Ask how the guidelines apply to you. The checkup should always include health counseling (such as tips on quitting smoking) and examinations for cancer of the thyroid, testes, prostate, mouth, ovaries, skin, and lymph nodes.

In particular:

- Ages 20-40—For breast cancer, an examination by a physician every three years, a self-exam every month, and one baseline breast x-ray between the ages of 35 and 39. For cervical cancer, women who are or have been sexually active, or have reached age 18, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician.
- Ages 40 and over—For breast cancer, a professional exam every year, a self-exam every month, and a breast x-ray every 1-2 years for those 40-49; every year for those 50 and over. For cervical cancer, women who are or have been sexually active, or have reached age 18 years, should have an annual Pap test and pelvic examination. After a woman has had three or more consecutive satisfactory normal annual examinations, the Pap test may be performed less frequently at the discretion of her physician. For women at high risk, an endometrial tissue sample should be taken at menopause. For colon and rectum cancer, a digital rectal exam every year after 40, and a stool blood test every year after 50, and a sigmoidoscopic exam every 3-5 years.

Some people are at higher risk for certain cancers and may need tests more frequently. (See pp. 9-14 for high risk factors.)

COLORECTAL CANCER: EARLY DETECTION IS THE KEY

When cancer of the colon and rectum is found and treated in an early, localized stage, the 5-year survival rate is 87% for colon cancer and 79% for rectal cancer. However, survival figures drop to 40% and 34%, respectively, after the cancer has started to spread to other parts of the body.

Because colorectal cancer develops over a period of time, detection of the disease is possible long before symptoms appear. Early detection of small cancers and polyps reduces the likelihood of major surgery and the need for a colostomy (an abdominal opening created for the elimination of wastes). In fact, permanent colostomies are rare in cases of colon cancer, and are necessary in only 15% of rectal cancer cases.

Colorectal cancer is second only to lung cancer in terms of incidence. Currently, about 155,000 new cases develop each year; about 61,000 people die from the disease annually. The incidence of colorectal cancer tends to increase with age, starting at 40 years. More than 94% of all cases occur after the age of 50. Colorectal cancer occurs about equally in both sexes. Anyone with a personal or family history of colorectal cancer, polyps in the colon, or inflammatory bowel disease is at particularly high risk for the disease and should be examined carefully.

Evidence suggests that bowel cancer may be linked to a diet high in fat and/or low in fiber content.

Projected 5-year survival rates for colorectal cancer show that early detection saves lives. Currently, the 5-year survival rate is 52%. With the use of early detection techniques, such as the digital rectal exam, the stool blood test, and sigmoidoscopy, and with appropriate management, about 27,000 additional lives could be saved annually.

It is recommended that the following procedures, all part of a cancer-related checkup, be performed at designated intervals:

- A digital rectal examination every year after age 40.
- A stool blood test every year after age 50.
- A sigmoidoscopy every three to five years after the age of 50.

These guidelines apply *only* to people without symptoms. Persons with rectal bleeding, cramping abdominal pain, or a change in bowel habits should see their physicians immediately.

A 1987 study of men and women age 40 and over, conducted for the Society by the Gallup Organization, revealed a number of important findings concerning Americans' attitudes toward detection measures for colorectal cancer. There has been some increase in public awareness of the 3 tests recommended to detect the disease, but there is much room for improvement. The study found, for instance, that the percentage of Americans who ever had a digital rectal examination increased slightly since 1983, from 51% to 56%. Likewise, the percentage of Americans who ever had a stool blood test rose, from 28% in 1983 to 40% in 1987. And while the percentage of men and women 50 and over who ever had a proctoscopic examination rose from 31% in 1983 to 42% in 1987, 60% of Americans who should have the examination (according to Society guidelines) have not had it.

The survey also showed that 24% of those individuals in the 40-plus age group have ever asked their doctor to examine their colon or rectum. And of this group, more than half did so only because something was bothering them.

On the promising side, the survey showed that almost 50% of all Americans would be interested in learning more about this form of cancer.

PREVENTION

BREAST CANCER: A PROGRAM OF ACTION

About one of every 10 women in the United States will develop breast cancer during her lifetime. And until the disease can be prevented, the best way women can protect themselves is through early detection and prompt treatment. Today, with modern technologies, breast cancer can be detected at very early stages of development, when the chance of cure is highest.

The risk of breast cancer increases as a woman grows older, and genetic and lifestyle variances—a history of breast cancer in a close family relative, giving first birth after age 30, never giving birth, and obesity (body weight 40% above normal)—may increase risk further.

The American Cancer Society recommends that women develop a three-part, personal plan of action, in cooperation with their doctors, for early detection of breast cancer. (See p. 19 for Checkup Guidelines.)

A **clinical breast exam** should be performed by a doctor as part of a regular health checkup. This includes a visual inspection of the breasts, looking for changes in shape or size or skin dimpling, followed by a thorough inspection of the breast, chest and armpits. Women should ask their doctors how often they should have a clinical breast exam.

A **mammogram** is a low-dose breast x-ray that can identify cancers too small to be felt. The Society guidelines for recommended frequency should be followed (see p. 18) in accordance with age and health history. Recent improvements have reduced the amount of radiation necessary for high-quality mammograms.

The Society recommends that all women over the age of 20 perform **breast self-examination** (BSE) once a month. BSE is important because breast cancer symptoms may develop and be found between clinical breast exams or mammography. Through regular BSE, women become familiar with their breasts; thus changes are more likely to be noticed.

TOBACCO USE

A major report of the Surgeon General covering 25 years of progress since the Surgeon General's Report in 1964 was issued in January 1989. The highlights of the report include: Prevalence of smoking has decreased from 40% in 1965 to 29% in 1987. Between 1964 and 1985, approximately three-quarters of a million smoking-related deaths were avoided or postponed as a result of decisions to quit smoking or not to start. Smoking rates are higher among blacks, blue-collar workers, and less-educated people than in the overall population. Smoking is responsible for more than one of six deaths in the United States. Smoking remains the single most important preventable cause of death in our society.

Based on updated data from Cancer Prevention Study II, the report estimates that smoking is related to 390,000 deaths each year.

In 1987, it was estimated that 45% of all adults who ever smoked have quit. However, children (especially girls) are starting to smoke at earlier ages. Among smokers born since 1935, more than 80% started smoking before age 21.

The American Cancer Society estimates that cigarette smoking is responsible for 85% of lung cancer cases among men and 75% among women—about 83% overall.

The higher cancer rates for men reflect that fact that in the past, more men than women smoked, and smoked more heavily. In recent years, however, the gap between numbers of men and women smoking has been narrowed.

Smoking also has been implicated in cancers of the mouth, pharynx, larynx, esophagus, pancreas, uterine cervix, and bladder. Smoking accounts for about 30% of all cancer deaths, is a major cause of heart disease, and is linked to conditions ranging from colds and gastric ulcers to chronic bronchitis, emphysema, and cerebrovascular disease.

A September 1985 study by the US Congress Office of Technology Assessment estimates the cost of smoking to the economy from $38 billion to $95 billion with a middle estimate of $65 billion. This amounts to $2.17 in lost productivity and the treatment of smoking-related diseases for each pack of cigarettes sold.

A Decline in Smoking

From 1976 to 1987, adult male smokers (20 years and older) dropped from 42% of the population to 31%, while women smokers decreased from 32% to 27%, according to the National Center for Health Statistics. Overall, the percentage of adult smokers in the population has dropped to 29%.

Per capita cigarette consumption among adults has fallen—from 4,141 in 1974 to 2,936 in 1989—reflecting a growing number of exsmokers. This is the lowest per capita consumption since 1942. From 1965 to 1987, the proportion of adult male exsmokers (20 years and older) in the total US population increased from 20% to 29%, while female exsmokers rose from 8% to 17%.

A survey supported by the National Institute on Drug Abuse indicated that the percentage of high school seniors (aged 17 and 18) who smoked cigarettes daily decreased from 29% in 1976 to 18% in 1988.

It is now estimated—from past national surveys and data from the Cancer Prevention Study II—that in the US today there are about 40 million excigarette smokers and about 49 million smokers.

At the same time, however, the average smoker appears to be smoking more heavily. The proportion of adult male smokers (20 years and older) consuming 25 or more cigarettes per day increased from 30.7% to 32% between 1976 and 1985, and female smokers from 19% to 21%.

A June 1989 tobacco report of the US Department of Agriculture estimates US cigarette output from July 1988 to June 1989 at 685 billion, down 3% from the period

PREVENTION

July 1987 to June 1988. Figures from the USDA show that 542 billion cigarettes were consumed in 1989, down from 563 billion in 1988. However, US cigarette exports have increased 130% since 1985.

Nicotine Addiction

The Surgeon General released a report on nicotine addiction in May 1988. The report points out that all tobacco products contain substantial amounts of nicotine. Nicotine is absorbed readily from tobacco smoke in the lungs and from smokeless tobacco in the mouth or nose, and is rapidly distributed throughout the body. The conclusions were:
1) cigarettes and other forms of tobacco are addicting; 2) nicotine is the drug in tobacco that causes addiction; and 3) the pharmacologic and behavioral processes that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine.

Involuntary Smoking Hazards

There are hazards for nonsmokers who breathe the smoke of others' cigarettes. Several scientific studies, including a recent study by the American Cancer Society, have found an increased risk of lung cancer among nonsmoking wives of cigarette smokers. Although some studies have not shown an effect, evidence continues to grow indicating that involuntary smoking is a hazard.

Two major reviews in 1986 by the Surgeon General and the National Academy of Sciences state that involuntary smoking is a health hazard. Another NAS report, also published in 1986, states that the amount of smoke inhaled on airplane trips constitutes a hazard, particularly to airline personnel, and recommended that cigarette smoking on airlines be banned.

The Society's Cancer Prevention Study II, involving more than one million Americans, will include a careful assessment of cancer risk and other diseases among smokers and involuntary smokers.

Smokeless Tobacco

There has been a recent resurgence in the use of all forms of smokeless tobacco—plug, leaf, and snuff—but the greatest cause for concern centers on the increased use of "dipping snuff." In this practice, tobacco that has been processed into a coarse, moist powder is placed between the cheek and gum, and nicotine, along with a number of other carcinogens, is absorbed through the oral tissue. "Dipping snuff" is a highly addictive habit, one that exposes the body to levels of nicotine equal to those of cigarettes. A 1986 report of the Advisory Committee to the Surgeon General, outlining the health consequences of smokeless tobacco use, concluded that there is strong scientific evidence that the use of snuff causes cancer in humans, particularly cancer of the oral cavity. Oral cancer occurs several times more frequently among snuff dippers compared with non-tobacco users, and the excess risk of cancer of the cheek and gum may reach nearly fifty-fold among long-term snuff users. Smokeless tobacco is becoming a problem large in scope; the report found that in 1985 smokeless tobacco was used by at least 12 million people in the United States, and half of these were regular users. The use of smokeless tobacco is increasing among male adolescents and young male adults.

Industrial Hazards

Industrial workers are especially susceptible to lung diseases due to the combined effects of cigarette smoking and exposure to toxic industrial substances, such as fumes from rubber and chlorine, and dust from cotton and coal. Exposure to asbestos in combination with cigarette smoking increases an individual's lung cancer risk nearly 60 times.

CANCER RISK ASSESSMENT

Cancer risk assessment is essential to create the standards and practices which protect people against unsafe exposures to radiation and chemicals. The assessment process requires information about: 1) the toxic properties of a potentially oncogenic medium and 2) the extent to which human exposure occurs. The first step is to identify the hazard, its chemical structure or physical nature and its toxic properties when tested under laboratory conditions in animals or cell systems. Toxicity is then investigated further in terms of dose-response relationships, the manner in which toxic effects increase with dose of toxin.

Exposure assessment involves: 1) measuring the concentration of the material in the environment to which people are potentially exposed (air, water, food, medications, workplace) and 2) measuring the extent to which people are actually exposed (how much they eat of a particular food product, use a particular medication, etc.) This information, together with knowledge of the pathways by which the toxin is absorbed, metabolized, and excreted in the body, provides an evaluation of exposure which, coupled with the evaluation of toxicity, results in the eventual risk assessment.

For most potential carcinogens, risk assessment involves two stages at which extrapolation of information is required: extrapolation of observed animal toxicity to what might be expected in humans and extrapolation of effects seen at high doses to what might be expected at low doses. In both procedures, conservative assumptions are made (for example, a linear no-threshold model for extrapolating low-dose effects) so that if the eventual risk assessment is in error, it will have erred on the side of safety. For cancer risk estimations, only risk levels of one case per million persons per lifetime or smaller are usually accepted.

From this process of risk assessment, safety standards for chemical or radiation exposures are developed, and they form the basis for the regulatory activities of such federal agencies as the Food and Drug Administration, Environmental Protection Agency, and Occupational Safety and Health Administration. The development of laws and procedures by which risks are eliminated or controlled is termed "Risk Management."

PREVENTION/THE AMERICAN CANCER SOCIETY

NUTRITION AND CANCER: A COMMON SENSE APPROACH

Evidence indicates that people might reduce their cancer risk by observing these guidelines:

1. Avoid obesity. Individuals 40% or more overweight increase their risk of colon, breast, prostate, gallbladder, ovary, and uterine cancers. Physicians can recommend a suitable diet and exercise regimen to help maintain an appropriate weight.

2. Cut down on total fat intake. A diet high in fat may be a factor in the development of certain cancers, particularly breast, colon, and prostate.

3. Eat more high-fiber foods such as whole grain cereals, fruits, and vegetables. Studies suggest that diets high in fiber may help to reduce the risk of colon cancer.

4. Include foods rich in vitamins A and C in your daily diet. These foods may help lower risk for cancers of the larynx, esophagus, and the lung: dark green and deep yellow fresh vegetables and fruits, such as carrots, spinach, sweet potatoes, peaches, and apricots as sources of vitamin A; and oranges, grapefruit, strawberries, green and red peppers for vitamin C.

5. Include cruciferous vegetables in your diet. Certain vegetables in the cruciferous family—cabbage, broccoli, brussels sprouts, kohlrabi and cauliflower—may help prevent certain cancers from developing.

6. Eat moderately of salt-cured, smoked and nitrite-cured foods. In areas of the world where salt-cured and smoked foods are eaten frequently, there is more incidence of cancer of the esophagus and stomach. The American food industry has developed new processes to avoid possible cancer-causing by-products.

7. Keep alcohol consumption moderate, if you do drink. The heavy use of alcohol, especially when accompanied by cigarette smoking or smokeless tobacco, increases risk of cancers of the mouth, larynx, throat, esophagus and liver.

THE AMERICAN CANCER SOCIETY

PROFILE

The Society traces its origins to 1913, when a group of ten physicians and five laymen met in New York City and founded the American Society for the Control of Cancer. Its stated purpose at the time was to "disseminate knowledge concerning the symptoms, treatment, and prevention of cancer; to investigate conditions under which cancer is found; and to compile statistics in regard thereto." Later renamed the American Cancer Society, it is today one of the oldest and largest voluntary health agencies in the United States, comprised of 2.5 million Americans united to conquer cancer through balanced programs of research, education, patient service, and rehabilitation.

Organization: The American Cancer Society, Inc. is composed of a National Society, with 57 chartered Divisions and over 3,300 Units.

The National Society: A 206-member House of Delegates provides a basic representation from the 57 Divisions and additional representation on the basis of population. It elects and is governed by a Board of Directors of 124 voting members, half of whom are members of the medical or scientific professions.

The National Society is responsible for overall planning and coordination, provides technical help and materials to Divisions and Units, administers programs of research, medical grants and clinical fellowships, and carries out public and professional education on the national level.

The 57 Divisions: These are governed by members of Divisional Boards of Directors, both medical and lay, in all the states plus five metropolitan areas, the District of Columbia and Puerto Rico.

The Units: These are organized to cover the counties in the United States. There are thousands of community leaders who direct the Society's programs at this level.

The Programs: The Society maintains its priorities and goals through activities developed by the departments of Research, Professional Education, Public Education, Public Information, Communications, Epidemiology and Statistics, Service and Rehabilitation, Public Affairs, and Crusade/Income Development.

PUBLIC EDUCATION

The American Cancer Society's Public Education programs are designed to inform people about cancer, tell them what they can do to protect themselves, and demonstrate related health habits.

The programs focus on two areas: cancer prevention which includes smoking control and the relationship between diet, nutrition, and cancer; and the importance and value of periodic, cancer-related checkups and specific early cancer detection tests. Prompt action if one of cancer's seven warning signals occurs is also encouraged.

Six cancer sites account for the majority of cancer cases and about half of cancer deaths—colon and rectum, lung, breast, uterus, oral cavity, and skin. The

THE AMERICAN CANCER SOCIETY

Society's Public Education planning strategy emphasizes these six sites where prevention, risk reduction, and early detection practices realize the greatest return in terms of lives saved.

The Society's Public Education programs are divided into two categories: adult and youth. Adults are reached through the worksite, healthsite, and community in small group settings or on a one-to-one basis. Whenever possible, volunteers are selected on the basis of skills that can be readily adapted to Public Education. Volunteers include exsmokers with group experience who can help in smoking cessation programs, and health professionals who can teach breast self-examination to groups of women.

Youth programs are usually conducted as part of a comprehensive health education program in the schools. The programs are organized according to grade level and the appropriate messages which will affect cancer risk significantly through strategies designed to teach young people to adopt good health habits, to make health-enhancing lifestyle decisions, and, to understand health behavior as it relates to cancer risk reduction.

Last year, the American Cancer Society's nationwide Public Education programs reached 23 million adults and 27 million young people. Some of the programs the Society has recently launched include Taking Control, Eating Smart, Changing the Course, and Smart Move for a healthier life of reduced cancer risk; Special Delivery, for pregnant women who are smokers; Starting Free: Good Air For Me for preschool children; Where There's No Smoke... on involuntary tobacco smoke; and an educational emphasis on breast cancer detection awareness, Special Touch.

PROFESSIONAL EDUCATION

Professional Education programs bring the latest developments in cancer control and management to health professionals, especially primary care providers.

Professional Education's national conferences, clinical awards, materials, professorships, and scholarships provide information and training in prevention and early detection of cancer, and in the treatment and rehabilitation of cancer patients. Breast Cancer Detection Awareness, Colorectal Health Check, and Tobacco-Free Young America are among the programs promoted by Professional Education.

Audiovisuals, Journals, and Other Publications

Videotapes, films, slide sets, audiotapes, publications and exhibits are available for physicians and other health professionals as well as for programs in hospitals, medical, dental and nursing schools. The Society publishes several texts and pamphlets dealing with various cancer issues along with proceedings of its conferences and workshops. Audiovisuals and other publications are distributed through Divisions and Units.

Ca-A Cancer Journal for Clinicians, (470,000 circulated) is directed to health professionals. The Society supports the publication of *Cancer,* a journal for those specializing in cancer research and in the care of the cancer patient.

Nursing Programs

Cancer Nursing News, a free newsletter for nurses, provides up-to-date information on cancer, oncology nursing, the American Cancer Society, and opportunities in continuing education. Requests for subscriptions should be sent to the Executive Editor, *Cancer Nursing News,* c/o American Cancer Society, 1599 Clifton Road, N.E., Atlanta, GA 30329.

Twenty new scholarships are awarded each year to qualified graduate students studying for a master's degree with a specialty in oncology nursing. Scholarships are $8,000 a year for up to two years based on the student's continuing progress in the graduate program.

Three new scholarships are awarded each year to doctoral students. These scholarships are $8,000 a year for up to four years.

Professorships in Clinical Oncology

Leading experts in oncology are supported to promote cancer education in medical and dental schools. Since the award's inception in 1970, the Society has funded 57 professors.

Clinical Oncology Awards

The National Clinical Awards Program was established in 1948 to provide broad support for oncology training at qualified hospitals and institutions. Over the past 40 years, regular Clinical Fellowships and Junior Faculty Clinical Fellowships have had considerable impact on the training of physicians and dentists in oncology specialties, training over 8,500 individuals to provide care to cancer patients nationwide.

Currently, funds are provided via the Clinical Oncology Fellowships (COF) and Clinical Oncology Career Development Award (CDA). The COF provides unique training opportunities for fellows to expand their expertise in oncology. The CDA is awarded to outstanding individuals pursuing an academic career in oncology.

The Society also annually offers a traineeship for Oncology Social Workers committed to clinical practice and research to benefit cancer patients and their families. The first awards were made in 1989 to 24 master's and post-master's candidates.

Unproven Methods of Cancer Management

The American Cancer Society maintains information on unproven methods of cancer management. This information is reviewed in-depth and is issued in position statements. These statements are available on request to physicians, science writers, editors and the general public.

THE AMERICAN CANCER SOCIETY

SERVICE AND REHABILITATION

In 1989, approximately 665,000 cancer patients were reached through the innovative service and rehabilitation programs of the American Cancer Society.

Service Programs

Resources, Information, and Guidance Services. Specific information about cancer is provided, as well as referral to Society services and other resources in the community to meet the social, psychological, and home care needs of cancer patients and their families.

Home Care Items. This program provides necessary, useful home care supplies, equipment, dressings, and gifts for the comfort and recreation of the patient.

Transportation. Volunteer drivers provide transportation that enables patients to maintain their medical and continuing care programs.

Rehabilitation Programs

CanSurmount. This is a short-term visitor program for cancer patients and their families. Hospital and home visits are made with the approval of the physician. The one-to-one visit by a person who has experienced the same type of cancer offers functional, emotional, and social support.

Reach to Recovery. This program, the largest of the Society's patient-visitor programs, addresses the physical, emotional, and cosmetic needs of women who have or have had breast cancer. Carefully selected and trained volunteer visitors provide support and information, with the approval of the attending physician. In addition, literature and services to help husbands, children, and friends of breast cancer patients are available.

Laryngectomy Rehabilitation. Spearheaded by the International Association of Laryngectomees (IAL), this program is coordinated through more than 275 clubs. Laryngectomee visitors provide pre- and/or postoperative support to patients who have recently undergone removal of the larynx.

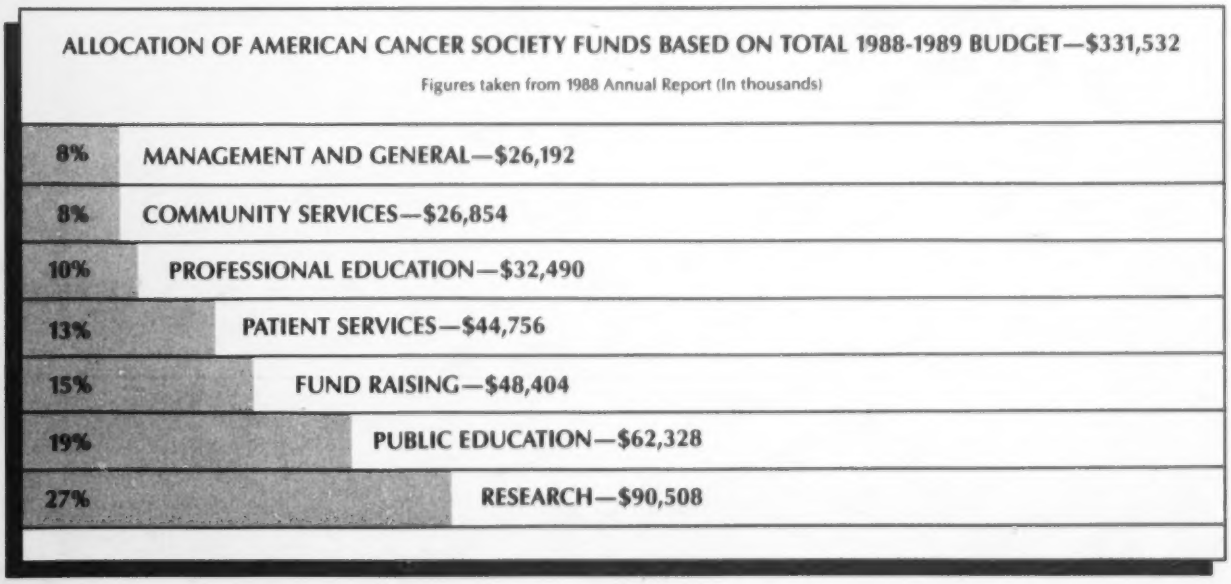
Ostomy Rehabilitation. Some patients with intestinal or urinary cancers must have abdominal ostomies (surgically constructed openings for elimination of body wastes). Trained volunteers who have experienced this same type of surgery offer help on a one-to-one basis. Cooperating with the United Ostomy Association and enterostomal therapists, patients are assisted in their physical and psychological adjustment.

Patient and Family Education Programs

The Society sponsors group and individual education programs, distributes pamphlets and booklets and provides audiovisual presentations for patients of all ages and their families to help them understand and deal with the complexities of the disease.

I Can Cope. Information is provided on cancer and its treatments, nutrition, resource availability, and other topics of interest to cancer patients and their families.

ALLOCATION OF AMERICAN CANCER SOCIETY FUNDS


ALLOCATION OF AMERICAN CANCER SOCIETY FUNDS BASED ON TOTAL 1988-1989 BUDGET—$331,532
Figures taken from 1988 Annual Report (In thousands)
8% MANAGEMENT AND GENERAL—$26,192
8% COMMUNITY SERVICES—$26,854
10% PROFESSIONAL EDUCATION—$32,490
13% PATIENT SERVICES—$44,756
15% FUND RAISING—$48,404
19% PUBLIC EDUCATION—$62,328
27% RESEARCH—$90,508

RESEARCH

The purpose of cancer research is to determine the causes, prevention and cure of cancer at the earliest possible time. Research requires highly trained personnel and laboratory facilities and supplies for each project—all are resources that cost money. The American Cancer Society is the largest source of private cancer research funds in the United States, second only to the National Cancer Institute, an agency of the federal government.

The Society's overall investment in research has grown steadily from $1 million in 1946 to over $90 million this year. The sum represents nearly a third of the total budget. To date, the Society has invested more than $1 billion in cancer research.

The research program focuses primarily on investigator-initiated projects, rather than directed research undertaken on a contract basis. With the exception of staff and facilities to carry out its epidemiologic studies, the Society neither hires staff researchers nor operates its own laboratories. This gives the Society the freedom to place its grants in established medical centers and other scientific institutions across the country, where the most innovative and promising ideas are being explored. In this way there is a minimum of overhead and a maximum of flexibility to make sure that research money has the highest probability of yielding results that will benefit people.

Applications for American Cancer Society grants are put through a rigorous process of evaluation, beginning with careful study by the appropriate one of 13 scientific review committees and then by two additional groups of experts, before being given final approval by the National Board of Directors.

Types of Grants

The Society's research program is diverse in concept and recipients. Overall, the program offers five major types of grants: (1) Research and Clinical Investigation Grants to finance investigator-initiated research; (2) Research Personnel Grants to provide salary support, both for established scientists and for postdoctoral fellows specializing or planning to specialize in cancer research; (3) Institutional Research Grants to universities, institutes and hospitals to support pilot studies and the work of young investigators in cancer); (4) Research Development Program Grants to provide rapid funding for priority projects; and (5) Special Institutional Grants to provide long term funding for interdisciplinary projects for which support is not readily available through the Society's other programs.

Approximately 75% of the Society's research budget is made available to investigators in the form of Research and Clinical Investigation Grants and close to 20% is allocated to the Research Personnel Grants Program.

The following types of awards deserve special mention as they are unique among granting agencies.

Research Professorships. The Research Professorship program has been in existence since 1957. This award supports some of the nation's most gifted scientists until their retirement. These are people devoting their lives' work to cancer research. Freed of major administrative responsibilities and other restrictions, they can concentrate on their fields of scientific investigation. There are currently 23 American Cancer Society Research Professors.

Clinical Research Professorships. This program was initiated in 1987 and provides long term support for clinician-scientists who are able to facilitate advances in clinical cancer research by bridging the gap between basic science and clinical medicine. Three such awards are currently in effect.

Physicians' Research Training Fellowships. This type of Research Personnel Grant was inaugurated in 1981 because of a dearth of MDs in the research field. It provides an opportunity for physicians to take three years from their medical careers to train as researchers.

Another unique program with potentially great impact is the Research Development Program, which was established to identify and provide funding for high priority projects. Approved applications can be funded in less than three months compared with the 10 to 18 months it may take the federal government to fund a new project.

Frontiers in Cancer Research

Interferon Research. Interferons, a group of natural body proteins, were originally discovered as antiviral agents, and later found to have some anticancer activity as well. In the late 1970s and early 1980s, the American Cancer Society provided massive support for clinical trials to test this anticancer activity in humans, and interferons are now being used successfully in the treatment of hairy cell leukemia and patients with certain forms of lymphomas and papillomas have response rates approaching 90%. More temporary responses may also be seen in kidney cancer, Kaposi's sarcoma, melanoma, and chronic myelogenous leukemia. The thrust of current research with interferons is to attempt to improve their effectiveness by combining them with more conventional chemotherapeutic drugs and by using mixtures of different interferons.

Genetic Engineering. One method in this new technology, recombinant DNA, is already being used to produce interferon. Among its potential applications are the manufacture of powerful new drugs, correcting impaired immune systems, even modifying heredity by transplanting foreign genes. It is hoped that the process will yield other anticancer activities. Some that appear quite promising at the moment are interleukin-2 and certain bone marrow growth regulators. With the discovery that the over-expression or faulty expression of oncogenes is associated with the majority of cancers, it might be possible through genetic engineering to modify expression of these genes and thereby change the natural course of the disease. Research is actively pursuing the possibility of selectively blocking the expression of genes that promote the growth of cancer.

Monoclonal Antibodies. Tailor-made, highly specific

RESEARCH

monoclonal antibodies can be produced that will preferentially recognize cancer cells, and thus be able to detect cancer early when the disease is most curable, before clinical signs appear. Monoclonal antibodies already have been conjugated to anticancer substances in order to deliver them directly to tumors. The monoclonal antibodies in these conjugates act as homing devices directed against tumor cells. The drugs conjugated to the monoclonal antibodies will then kill the tumors and healthy surrounding tissues will be spared.

Mechanisms of Carcinogenesis. In order to find effective means to combat cancer, it is important to understand how tumors arise. Investigators are approaching key questions about carcinogenesis from many different angles. A generally accepted model is that tumors form by a multistage process. These stages have been identified as initiation, promotion, and progression phases. These phases have been experimentally identified by the induction of tumors with chemical carcinogens. It is quite likely that oncogenes are affected by these carcinogens at various stages of the process. Other questions include: Are there proto-oncogenes, normal genes serving as master switches for early tissue development, which induce normal cells to become cancerous later in life? If so, what turns them on? Can they be programmed to stay off? Do viruses, already known to cause cancer in animals, also cause cancer in humans, perhaps by activation of these proto-oncogenes? Conversely, a normal gene that appears to suppress cancer development has been isolated recently. Does this gene produce a substance that stops normal cells from dividing before they become cancerous? Many of these questions are now being answered. A surprising finding is that colon cancer develops over the course of years as a result of a series of genetic changes or mutations like turning on a set of switches that promote growth and others that slow growth.

Cell Growth Regulation. In recent years a variety of growth factors as well as their receptors have been identified and purified. Most importantly, many of them have been associated with oncogene products. In some instances, normal cells may be dependent on growth factors and/or inhibitors from adjacent cells or even far-away organs. Tumor cells have escaped from this extra-cellular control. In addition to growth factors, specific inhibitors have been discovered which modify the growth factor effects.

Production of antibodies against growth factors, exposure of tumor cells to inhibitors, and alteration of receptor affinity for growth factors are being actively investigated as possible ways to check the unregulated growth of tumor cells. Some of the growth factors that modulate proliferation and differentiation of blood cells have entered clinical trials. Potential application of these growth factors include conditions of inadequate bone marrow function and impaired host defenses against infections related to neoplastic and immunodeficiency disorders.

Drug Development. Development of new cancer drugs is necessary for two reasons. One is that most cancer drugs are also toxic for normal cells and the aim is to develop drugs which will be less toxic for normal cells and more potent against tumor cells. Efforts must continue to discover the differences between normal and neoplastic cells. More useful drugs to exploit such differences can then be developed.

A second reason for the development of new anticancer drugs is the finding that cancer cells develop resistance to many known natural and synthetic drugs; normal cells do not. The development of new drugs and modification of existing ones is essential to permit exposure of the tumors to additional drugs they have not come in contact with before. The greater the number of different types of drugs that can be used against tumor cells, the smaller the probability that resistance can develop and the greater the chance of tumor cell eradication. There are some exciting ideas of how to counteract drug resistance and this is a very active area of American Cancer Society sponsored research. Other novel treatments with radiation and surgical techniques are also yielding better ways to treat resistant cancers.

Psychosocial, Behavioral, and Nutritional Influences on Cancer. There is strong evidence that nutrition, the environment, and physical condition influence a person's general health and possibly the chances of contracting cancer as well as the ability to cope with cancer. Nutritional and environmental factors may have a direct influence on certain diseases or an indirect effect by modulating the immune system. It has been very difficult over the years to obtain reliable data on the influence of psychosocial factors on the incidence of cancer. The Society is committed to support research which will provide reliable data in these areas. Research on behavior modification is having a significant impact on symptoms of cancer and its treatment, such as pain, nausea and vomiting, and stress.

It is an unfortunate fact that cancer occurrence and cancer fatalities are more frequent among the socially disadvantaged population groups. More research is needed in these areas to identify the causes for this disparity and to suggest remedies. Through its psychosocial research program and other programs, the Society is encouraging such investigations. We are also addressing new diagnostic techniques and health maintenance strategies for all citizens.

CANCER AND THE ENVIRONMENT

Most cancer cases in the United States are believed to be environmentally related, that is, associated in some way with our physical surroundings, personal habits, or lifestyles.

Occupational hazards, although associated with only a small percentage of cancers, are under close surveillance. Virtually every suspected major chemical and other substance in the workplace presumed to be a health risk is under investigation. Each study can require years and hundreds of thousands of dollars to complete.

RESEARCH

Some environmental causes of cancer are well known. About 30% of all cancers are directly related to the use of tobacco.

Other causes are harder to determine. Diet is suspected as an important element in cancer risk, some say as much as 35% of all cancer deaths. There is much research underway on the role diet and nutrition play in the development of cancer. (See also page 22.)

To help identify environmental factors in human cancer, the American Cancer Society has undertaken a two-part program of environmental cancer research. This involves Cancer Prevention Study II, an epidemiologic study to examine the relationship of environment and lifestyle to cancer development; and support of extramural cancer cause and prevention research projects.

The American Cancer Society's Cancer Prevention Study II

One of the largest research studies ever carried out in the United States was launched in 1982. Cancer Prevention Study II, a long-term prospective study, is examining the habits and exposures of more than one million Americans to learn how lifestyles and environmental factors affect the development of cancer.

Modeled after the first Cancer Prevention Study (1959-72), CPS-II is similar in method but wider in scope and involves more participants.

Over 77,000 volunteers enrolled 1.2 million men and women in the study. These volunteer researchers distributed a four-page confidential questionnaire to participants who were asked about their exposures to certain environmental conditions, their history of disease and their lifestyles. The questionnaires were designed to elicit more than 500 pieces of information each, which were computerized for statistical analysis.

Many of the questions focus on health issues of current concern. These include risks of certain drugs, foods and various occupational exposures; low-tar and low-nicotine cigarettes; consumer products; long-term exposure to low-level radiation; and the health effects associated with air and water pollution.

For a period of six years, the volunteers will keep track of the status and whereabouts of study participants. Various suspected relationships will be tested by comparing mortality rates of differently exposed groups.

The goal of the study is to identify those factors that increase a person's chances of developing cancer, those that carry little or no risk, and those that actually may help prevent cancer.

So far, 14 papers have been published from the analyses of data on the original questionnaires and followup reports. One showed massive changes in American smoking habits compared with 23 years earlier in CPS I. Among men, 24% smoked, half as many as in the earlier study. More than twice as many had quit cigarette smoking. Among women, the percent of exsmokers quadrupled. Another paper showed that the percentage of physicians who smoke is now down to 16%, and is about 14% in dentists and 23% in nurses. A third paper showed that a greater percentage of women who used artificial sweetners gained weight over a one-year period than nonusers. Another paper showed that death rates from all causes were 81% higher in obese and underweight people than those of average weight and that degree of exercise was negatively correlated with cancer death rates. A paper on smoking in women showed that smokers die of lung cancer at a rate 12 times that of nonsmokers.

Since the first study, new factors in our environment have been identified that may be related to cancer. The Society decided to initiate a second study to respond to the concerns of the public and scientific community about suspected carcinogens.

Without the use of our volunteers, the cost of carrying out CPS II would total more than $100 million. With volunteers to collect the data, it is estimated the study will cost only about $9 million to complete.

CANCER'S SEVEN WARNING SIGNALS

1. Change in bowel or bladder habits
2. A sore that does not heal
3. Unusual bleeding or discharge
4. Thickening or lump in breast or elsewhere
5. Indigestion or difficulty in swallowing
6. Obvious change in wart or mole
7. Nagging cough or hoarseness

If you have a warning signal, see your doctor.

SUMMARY OF RESEARCH GRANTS & FELLOWSHIPS AWARDED BY AMERICAN CANCER SOCIETY (National And Divisions) DURING THE FISCAL YEAR ENDED AUGUST 31, 1989 (Subject to audit)

Baylor College of Medicine, Houston, TX	(8)	$1,216,000	Medical Biology Institute, La Jolla, CA	(2)	$ 161,000	Univ. of Chicago, Chicago, IL	(10)	$1,092,920
Beth Israel Hosp., Boston, MA	(1)	89,000	Medical Coll. of Georgia, Augusta, GA	(2)	205,000	Univ. of Cincinnati, Cincinnati, OH	( )	442,000
Boizentrum der Universitat, Switzerland	(1)	72,000	Medical Coll. of Pennsylvania, Philadelphia	(1)	112,000	Univ. of Colorado, Boulder, CO	(19)	1,887,435
Boston Univ., Boston, MA	(4)	650,500	Medical Coll. of Ohio, Toledo, OH	(2)	231,500	Univ. of Connecticut, Storrs	(3)	417,000
Brandeis Univ., Waltham, MA	(4)	318,000	Medical Coll. of Virginia, Richmond, VA	(1)	89,000	Univ. of Florida, Gainesville, FL	(2)	70,000
Brigham & Women's Hosp., Boston, MA	(1)	139,000	Medical Coll. of Wisconsin, Milwaukee, WI	(4)	279,030	Univ. of Georgia, Athens, GA	(2)	223,000
Brigham Young University, UT	(1)	113,000	Medical University of South Carolina	(4)	494,000	Univ. of Hawaii, Honolulu, HI	(3)	294,996
Brown Univ., Providence, RI	(5)	433,500	Memorial Hospital for Cancer & Allied Diseases	(2)	269,500	Univ. of Illinois, Urbana	(4)	579,000
California Institute of Technology, Pasadena, CA	(11)	1,113,050	Miami University, Oxford, OH	(1)	64,000	Univ. of Indiana, Bloomington, IN	(4)	461,000
Cancer Research Inc., Philadelphia, PA	(1)	140,000	Michael Reese Hospital, Chicago, IL	(1)	144,000	Univ. of Kansas, Lawrence	(4)	230,750
Carnegie Institute of Washington, DC	(3)	124,500	Michigan State Univ., East Lansing	(2)	270,000	Univ. of Kentucky, Lexington, KY	(3)	124,000
Carnegie-Mellon Univ., Pittsburgh, PA	(1)	246,000	Montana State University	(1)	30,000	Univ. of Maryland, Baltimore, MD	(3)	299,000
Case Western Reserve Univ., Cleveland, OH	(4)	424,000	Mount Sinai Sch. of Med., New York, NY	(8)	828,088	Univ. of Massachusetts, Amherst, MA	(1)	47,000
Center for Molecular Medicine, Newark, NJ	(1)	10,000	Nat'l Inst. of Allergy & Infectious Disease, MD	(1)	69,200	Univ. of Med. & Dentistry of NJ, Newark, NJ	(3)	418,000
Children's Hospital of Los Angeles, CA	(2)	270,500	Nat'l Jewish Hosp. & Res. Ctr., Denver, CO	(2)	386,000	Univ. of Miami, Coral Gables, FL	(3)	369,000
Children's Hospital of Pittsburgh, PA	(1)	75,000	New England Deaconess Hosp., Boston, MA	(1)	205,000	Univ. of Michigan, Ann Arbor, MI	(10)	959,000
Children's Hospital Research Foundation	(1)	47,000	New England Medical Center Hosp., Boston, MA	(1)	56.901	Univ. of Minnesota, Minneapolis, MN	(10)	1,021,671
City College of City University of New York, NY	(1)	40,000	New York Medical College, Valhalla, NY	(1)	78,000	Univ. of Mississippi, Jackson, MS	(1)	170,000
City of Hope National Med. Ctr., Duarte, CA	(2)	331,000	New York University, New York, NY	(10)	906,694	Univ. of Missouri, Columbia, MO	(2)	196,000
Cleveland Clinic Foundation, Cleveland, OH	(1)	85,000	Northeastern Univ., Boston, MA	(1)	160,000	Univ. of Nebraska, Omaha, NE	(2)	195,000
Cold Spring Harbor Lab., Cold Spring Hbr, NY	(5)	392,000	Northwestern Univ., Chicago, IL	(7)	851,319	Univ. of New Mexico, Albuquerque, NM	(1)	200,000
Colorado State University, Fort Collins, CO	(1)	47,000	Oak Ridge Nat'l Lab., Oak Ridge, TN	(1)	108,000	Univ. of North Carolina, Chapel Hill	(10)	929,000
Columbia University, New York, NY	(16)	1,875,500	Ohio State Univ., Columbus	(7)	522,800	Univ. of Oklahoma, Oklahoma City, OK	(1)	172,000
Cornell Univ., Ithaca, NY	(3)	389,000	Oregon Health Sciences Lab., Portland, OR	(1)	24,000	Univ. of Oregon, Eugene	(3)	515,911
Cornell Univ., New York, NY	(6)	708,200	Oregon State Coll., Sci. Res. Inst., Corvallis, OR	(1)	10,000	Univ. of Pennsylvania, Philadelphia, PA	(14)	1,464,500
Dana-Farber Cancer Ctr., Boston. MA	(13)	1,392,000	Oregon State Univ., Corvallis, OR	(2)	124,223	Univ. of Pittsburgh, Pittsburgh, PA	(7)	617,000
Dartmouth Coll., Hanover, NH	(3)	265,375	Oxford University, Oxford, England	(1)	70,171	Univ. of Rochester, Rochester, NY	(13)	1,842,500
Duke Univ., Durham, NC	(9)	1,045,000	Pennsylvania State Univ., Hershey, PA	(3)	125,000	Univ. of South Carolina, Columbia, SC	(1)	40,000
Duquesne Univ., Pittsburgh, PA	(1)	67,000	Princeton Univ., Princeton, NJ	(8)	652,045	Univ. of Southern California, Los Angeles	(5)	701,000
Emory Univ., Atlanta, GA	(1)	75,000	Pub. Health Res. Inst., New York, NY	(3)	200,000	Univ. of Tennessee, Memphis, TN	(3)	264,500
Eleanor Roosevelt Inst. for Ca. Res., Denver, CO	(2)	76,000	Purdue Univ., Lafayette, IN	(6)	492,000	Univ. of Texas (Various Locations)	(20)	2,136,000
Foundation for Biomedical Res., Washington, DC	(1)	10,000	Rice University, Houston, TX	(1)	140,000	Univ. of Utah, Salt Lake City, UT	(5)	614,300
Fred Hutchinson Cancer Res. Ctr., Seattle, WA	(10)	1,107,725	Robert Wood Johnson Med. School, Newark, NJ	(3)	385,500	Univ. of Vermont, Burlington, VT	(4)	547,000
Frederick Ca. Research Center, Frederick, MD	(1)	47,000	Rockefeller Univ., New York, NY	(4)	323,500	Univ. of Vermont & State Agriculture College	(2)	250,500
Genetics & Cancer Center, Scottsdale, AZ	(1)	80,000	Roswell Park Mem. Inst., Buffalo, NY	(11)	1,003,465	Univ. of Virginia, Charlottesville	(10)	1,118,000
George Washington University, Washington, DC	(2)	107,000	Rush Presbyterian-St. Luke's Medical Center	(1)	84,000	Univ. of Washington, Seattle, WA	(7)	754,500
Georgetown Univ., Washington, DC	(4)	625,000	Rutgers Univ., New Brunswick, NJ	(4)	397,980	Univ. of West Virginia	(1)	80,000
Gordon Research Conferences	(1)	6,000	St. Jude Children's Res. Hosp., Memphis, TN	(4)	431,000	Univ. of Wisconsin, Milwaukee, WI	(1)	188,000
H H Lehman College of City Univ. of NY	(1)	160,000	St. Louis Univ., St. Louis, MO	(2)	240,000	Univ. of Wisconsin, Madison, WI	(13)	991,425
Harvard University, Cambridge, MA	(15)	1,808,700	Salk Inst. for Biological Studies, San Diego, CA	(7)	432,400	Univ. of Wyoming, Laramie, WY	(1)	20,000
Harvard Medical School, Boston, MA	(11)	998,500	Scripps Clinic Res. Fdn., La Jolla, CA	(5)	374,000	Vanderbilt Univ., Nashville, TN	(4)	271,000
Harvard Sch. of Pub. Health, Boston, MA	(1)	69,000	Showa Univ. Res. Inst., St. Petersburg, FL	(1)	47,000	Virginia Commonwealth Univ.	(2)	130,000
Henry Ford Hospital, Detroit, MI	(1)	103,000	Sloan-Kettering Inst., New York, NY	(24)	2,691,500	Virginia Mason Hospital, Seattle, WA	(2)	284,000
Howard University, Washington, DC	(1)	113,000	Southwest Found. for Research and Educ., TX	(1)	160,000	Virginia Polytechnic Institute, Blacksburg, VA	(1)	121,000
Inst. for Cancer Res., Philadelphia, PA	(4)	392,000	SRI Internationl, Menlo Park, CA	(1)	130,000	Wake Forest Coll., Bowman Gray Sch. of Med., NC	(6)	527,000
International Union Against Cancer	(2)	670,000	Stanford Univ., Stanford, CA	(22)	1,829,171	Walter and Aliza Hall Inst. of Med., Australia	(1)	24,000
Iowa State University, Ames, IA	(2)	190,500	State Univ. of Iowa, Iowa City	(5)	550,500	Washington State Univ., Pullman, WA	(1)	35,000
Jackson Lab., Bar Harbor, ME	(3)	175,933	State Univ. of NY, Buffalo, NY	(2)	210,000	Washington Univ., St. Louis, MO	(11)	789,064
Jefferson Medical Coll., Philadelphia, PA	(1)	169,000	State Univ. of NY, Brooklyn	(1)	140,000	Wayne State Univ., Detroit, MI	(2)	198,000
Jewish Hospital of St. Louis, MO	(1)	171,000	State Univ. of NY, Stony Brook, NY	(10)	1,021,500	Wesleyan University,	(3)	201,000
Johns Hopkins Univ., Baltimore, MD	(23)	2,300,932	Syracuse Univ., Syracuse, NY	(2)	255,000	Whitehead Inst., Cambridge, MA	(7)	284,350
Joslin Diabetes Center, Boston, MA	(1)	160,000	Temple Univ., Philadelphia, PA	(3)	397,000	Wistar Inst., Philadelphia, PA	(4)	661,000
Kansas State Univ., Manhattan, KS	(1)	86,000	Texas A&M Univ., College Station, TX	(2)	240,000	Winthrop University Hospital	(1)	83,000
La Jolla Cancer Res. Ctr., La Jolla, CA	(3)	276,000	Tufts—New England Med. Ctr., Boston, MA	(2)	117,000	Yale Univ., New Haven, CT	(20)	2,079,320
Lehigh Univ., Bethlehem, PA	(1)	75,000	Tufts Univ., Medford, MA	(3)	293,500	Yeshiva Univ.—Albert Einstein, The Bronx, NY	(16)	2,061,000
Louisiana State Univ., Baton Rouge	(4)	475,936	Tulane Univ., New Orleans, LA	(2)	152,000	SUBTOTAL	(838)	84,918,328
MD Anderson Cancer Ctr., Houston, TX	(9)	933,500	Univ. of Alabama Med. Ctr., Birmingham	(3)	236.000	**Division Research Grants**		3,000,000
Marine Biology Lab., Woods Hole, MA	(1)	10,000	Univ. of Arizona, Tucson, AZ	(8)	1,073,000	TOTAL	(838)	87,918,328
Massachusetts General Hosp., Boston, MA	(4)	373,000	Univ. of Arkansas, Fayetteville, AR	(3)	215,000			
Massachusetts Inst. of Tech., Cambridge, MA	(18)	1,269,090	Univ. of Calif. (Various Locations), CA	(76)	7,195,258			

Note: Numbers in parentheses indicate number of grants per institution for the year ended August 31, 1989; totals subject to audit.

35-YEAR TRENDS IN AGE-ADJUSTED CANCER DEATH RATES PER 100,000 POPULATION 1949-51 to 1984-86

SITES	SEX	1949-51	1984-86	PERCENT CHANGES	COMMENTS
ALL SITES	Male	168.0	218.7	+ 30	Steady increase mainly due to lung cancer.
	Female	147.8	139.3	- 6	Early decrease, but recent increases due to lung cancer.
BLADDER	Male	7.2	6.0	- 17	Slight decrease in recent years.
	Female	3.2	1.7	- 46	Some fluctuations; noticeable decrease.
BRAIN	Male	3.3	4.9	+ 47	Early increase in both sexes; later leveling off, reasons unknown.
	Female	2.2	3.3	+ 51	
BREAST	Male	0.4	0.2	- 36	Steady decrease.
	Female	25.9	27.3	+ 5	Slight fluctuations; overall no change.
COLON & RECTUM	Male	25.4	24.9	*	Slight fluctuations; overall no change.
	Female	24.8	17.5	- 29	Slow, steady decrease.
COLON	Male	16.9	21.2	+ 26	Slow steady increase, then leveling in recent years.
	Female	18.8	15.3	- 18	Slow, steady decrease.
RECTUM	Male	9.3	3.8	- 59	Slow, steady decrease in both sexes.
	Female	6.5	2.2	- 42	
ESOPHAGUS	Male	4.7	5.7	+ 20	Some fluctuations; small increase.
	Female	1.2	1.5	+ 19	Slight fluctuations; small increase.
KIDNEY	Male	3.3	4.7	+ 44	Steady increase.
	Female	2.0	2.2	*	Slight fluctuations; overall no change.
LARYNX	Male	2.6	2.6	*	Slight fluctuations; overall no change.
	Female	0.3	0.5	+ 88	Steady increase in females.
LEUKEMIA	Male	7.3	8.4	+ 15	Early increase, later leveling off and decrease.
	Female	5.0	5.0	*	Early slight increase; later leveling off and decrease.
LIVER†	Male	6.9	4.8	- 31	Decreasing rapidly early; later leveling off.
	Female	8.0	3.3	- 59	Some fluctuations; steady decrease.
LUNG	Male	22.0	73.9	+236	Steady increase in both sexes due to cigarette smoking.
	Female	4.8	26.2	+450	
NON-HODGKIN'S LYMPHOMA	Male	3.6	6.9	+ 92	Steady increase in both sexes.
	Female	2.3	4.7	+103	
HODGKIN'S DISEASE	Male	2.2	0.9	- 60	Steady decrease in both sexes.
	Female	1.3	0.5	- 61	
MULTIPLE MYELOMA	Male	1.1	3.5	+215	Steady increase in both sexes.
	Female	2.3	4.7	+103	
ORAL	Male	6.4	5.0	- 21	Steady decrease.
	Female	1.6	1.8	+15	Slight fluctuations, overall no change.
OVARY	Female	7.9	7.7	*	Early increase; then leveling off and decrease.
PANCREAS	Male	8.2	10.2	+ 24	Early increase, later leveling off.
	Female	5.5	7.2	+ 32	Steady increase.
PROSTATE	Male	20.6	23.7	+ 15	Slight increase in recent years.
TOTAL SKIN	Male	3.3	4.1	+ 23	Some fluctuations; slight increase.
	Female	2.1	1.8	- 14	Slight decrease.
MELANOMA OF SKIN	Male	1.0	2.8	+183	Steady increase in both sexes.
	Female	0.8	1.5	+ 88	
OTHER SKIN	Male	2.2	1.3	- 42	Steady decrease in both sexes.
	Female	1.3	0.3	- 74	
STOMACH	Male	24.6	7.5	- 70	Steady decrease in both sexes; reasons unknown.
	Female	13.5	3.4	- 75	
UTERUS	Female	21.6	6.9	- 68	Steady decrease.

*Percent changes not listed because they are not meaningful. †Primary and non-specified.

CANCER AROUND THE WORLD, 1984-86

Age-Adjusted Death Rates Per 100,000 Population for Selected Sites for 50 Countries

COUNTRY	ALL SITES		ORAL		COLON & RECTUM		LUNG		BREAST	UTERUS		STOMACH		PROSTATE	LEUKEMIA	
	Male	Female	Male	Female	Male	Female	Male	Female	Female	Cervix	Other	Male	Female	Male	Male	Female
United States	216.6(26)	140.3(20)	5.0(29)	1.8(13)	24.2(22)	17.5(20)	73.5(12)	26.2(3)	27.4(16)	3.2(40)	3.7(33)	7.4(50)	3.4(50)	23.2(23)	8.3(6)	5.1(11)
Argentina†	196.7(32)	127.1(31)	5.1(26)	1.1(37)	21.1(24)	12.8(33)	50.4(31)	7.2(36)	24.6(23)	5.1(23)	8.4(6)	18.0(33)	8.3(34)	17.2(34)	6.0(35)	4.1(32)
Australia	218.2(24)	132.9(25)	6.0(20)	1.8(13)	33.3(6)	21.3(10)	61.4(26)	14.4(14)	25.2(21)	4.0(31)	2.8(47)	12.4(46)	5.6(46)	23.7(20)	8.2(8)	4.9(13)
Austria	237.5(14)	147.4(12)	6.6(15)	1.2(32)	35.1(3)	20.4(13)	63.4(22)	10.9(16)	27.1(18)	4.6(26)	3.2(44)	28.4(12)	14.2(10)	23.7(20)	7.5(17)	4.6(23)
Barbados*	150.7(44)	141.0(18)	8.4(8)	1.4(22)	9.3(42)	6.4(47)	21.4(45)	2.5(50)	28.2(14)	24.8(1)	1.5(50)	14.4(39)	10.3(24)	28.1(6)	6.2(33)	5.3(6)
Belgium#	281.2(3)	146.2(15)	4.6(31)	1.3(25)	32.4(7)	20.5(12)	104.1(2)	8.9(26)	32.2(7)	3.6(33)	5.1(21)	18.3(31)	13.3(13)	26.8(8)	7.7(12)	5.2(7)
Bulgaria	166.4(40)	106.1(39)	3.8(36)	0.9(43)	19.2(26)	12.9(31)	47.5(32)	8.4(29)	17.8(35)	4.2(27)	6.5(12)	28.3(13)	16.5(7)	10.5(43)	5.5(36)	3.9(38)
Canada	224.2(21)	142.2(17)	5.7(23)	1.8(13)	24.7(21)	18.3(19)	73.9(11)	21.9(9)	29.4(13)	3.1(41)	3.5(37)	12.0(47)	5.3(47)	23.7(20)	8.3(6)	4.9(13)
Chile	189.4(33)	146.3(14)	3.0(42)	0.8(45)	9.3(42)	9.0(39)	28.3(41)	7.7(35)	15.6(39)	15.6(4)	3.3(41)	46.9(4)	20.7(5)	18.8(33)	4.5(42)	4.0(35)
Costa Rica	214.5(27)	149.8(11)	5.1(26)	2.0(9)	11.5(40)	8.8(40)	22.3(44)	8.3(29)	15.7(38)	15.9(3)	4.4(26)	66.9(1)	34.1(2)	24.4(18)	7.3(19)	4.8(16)
Cuba	170.0(39)	121.6(34)	7.5(11)	2.3(6)	12.7(37)	14.5(25)	52.3(29)	18.3(11)	18.3(31)	6.2(17)	10.5(3)	10.5(49)	5.3(47)	24.5(17)	5.5(36)	4.5(24)
Czechoslovakia	289.3(2)	153.2(8)	8.2(9)	1.3(25)	41.2(1)	21.3(10)	93.2(4)	9.8(23)	24.3(24)	6.7(14)	7.8(8)	29.3(11)	14.4(9)	19.4(28)	8.2(8)	5.0(12)
Denmark	250.9(9)	181.4(1)	4.1(33)	1.7(17)	38.5(2)	25.3(2)	73.0(13)	24.8(6)	34.2(3)	7.3(13)	5.2(20)	14.0(43)	7.1(41)	26.7(9)	9.1(4)	5.6(3)
Ecuador	124.4(46)	119.2(36)	1.6(49)	1.2(32)	4.6(49)	4.4(49)	10.8(49)	4.2(48)	6.5(49)	9.2(9)	18.7(1)	41.3(5)	28.6(3)	16.2(35)	4.0(45)	3.3(42)
England & Wales	249.4(10)	164.1(4)	3.6(40)	1.7(17)	28.0(14)	20.4(13)	87.1(7)	24.9(5)	36.0(1)	5.7(20)	3.6(36)	20.4(25)	8.8(29)	22.3(24)	6.9(24)	4.4(25)
Finland	224.7(20)	124.7(32)	2.6(45)	1.3(25)	17.5(32)	13.0(29)	75.1(10)	8.3(33)	20.2(29)	2.6(44)	3.3(41)	21.8(22)	12.4(18)	25.0(15)	7.6(14)	4.9(13)
France	269.4(6)	120.1(35)	17.9(1)	1.6(19)	25.2(17)	15.4(24)	57.8(27)	5.6(40)	23.9(25)	2.4(45)	6.1(15)	14.8(36)	6.5(42)	25.6(13)	8.8(5)	5.2(7)
Germany, D.R.	216.7(25)	132.8(26)	5.1(26)	1.1(37)	24.8(19)	20.0(16)	66.9(19)	7.0(39)	20.9(28)	7.6(12)	5.5(17)	26.1(14)	12.9(15)	15.8(36)	6.4(29)	4.2(31)
Germany, F.R.	241.8(13)	146.9(13)	6.3(18)	1.1(37)	29.8(11)	22.6(4)	64.6(21)	8.9(26)	27.3(17)	4.2(27)	4.7(24)	23.5(19)	12.6(16)	24.8(16)	7.6(14)	4.8(16)
Greece	188.7(34)	101.1(45)	2.3(47)	0.7(47)	7.7(45)	7.0(45)	62.0(25)	8.4(29)	17.9(32)	1.7(48)	4.3(27)	14.0(43)	7.5(40)	11.9(42)	7.6(14)	4.8(16)
Hong Kong	220.9(22)	122.8(33)	17.3(2)	5.5(2)	19.0(27)	13.5(27)	71.6(14)	32.0(2)	10.6(45)	5.8(19)	2.0(48)	14.4(39)	7.9(35)	3.8(50)	4.3(44)	3.3(42)
Hungary	294.9(1)	164.4(3)	13.0(6)	1.9(10)	35.0(4)	24.2(3)	87.6(6)	14.9(13)	26.1(20)	8.5(10)	7.0(9)	34.9(7)	15.8(8)	24.1(19)	9.3(3)	5.5(4)
Iceland	180.1(37)	140.8(19)	3.0(42)	0.6(48)	15.9(35)	13.0(29)	32.0(37)	22.7(8)	25.1(22)	4.2(27)	3.1(45)	30.5(10)	9.9(26)	30.0(4)	9.6(2)	5.4(5)
Ireland	230.0(19)	160.7(5)	5.4(24)	2.1(8)	29.5(12)	22.2(5)	69.0(17)	23.0(7)	31.6(10)	3.3(36)	4.1(29)	19.5(27)	10.4(23)	22.0(25)	7.1(22)	4.7(19)
Israel	158.3(42)	127.9(29)	1.9(48)	1.0(40)	19.9(25)	15.9(22)	31.6(38)	10.3(21)	27.9(15)	1.6(49)	3.7(33)	14.2(42)	6.5(42)	12.3(40)	7.7(12)	5.2(7)
Japan	198.4(31)	104.1(43)	2.6(45)	0.8(45)	18.2(30)	12.2(35)	38.2(35)	10.5(18)	6.7(48)	2.4(45)	4.2(28)	54.6(2)	25.0(4)	5.1(49)	5.1(38)	3.3(42)
Kuwait§	139.9(45)	104.4(42)	3.7(38)	2.4(5)	5.6(48)	6.7(46)	31.6(38)	9.6(24)	12.9(43)	3.4(34)	2.9(46)	10.6(48)	6.3(45)	7.7(47)	6.9(24)	7.4(1)
Luxembourg	280.0(4)	150.6(9)	6.8(13)	1.3(25)	30.4(10)	21.5(8)	93.1(5)	11.3(15)	32.6(5)	2.7(42)	6.5(12)	18.6(30)	8.5(32)	25.8(12)	11.5(1)	5.8(2)
Malta	200.2(30)	131.2(27)	6.8(13)	1.5(20)	18.2(30)	14.2(26)	62.2(24)	5.5(12)	35.5(2)	1.9(47)	6.8(11)	21.7(23)	7.8(37)	14.2(37)	7.9(11)	3.6(40)
Martinique‡	220.1(23)	127.9(29)	15.5(4)	0.0(50)	12.5(38)	7.1(43)	12.5(48)	7.2(36)	26.2(19)	5.6(21)	13.3(2)	25.6(15)	12.6(16)	64.9(1)	3.8(47)	4.4(25)
Mauritius	113.4(48)	75.5(49)	4.1(33)	1.2(32)	6.1(47)	4.5(48)	26.7(42)	5.2(45)	8.3(47)	6.4(16)	8.5(5)	23.0(20)	9.2(28)	8.6(45)	2.7(48)	3.3(42)
Netherlands	271.2(5)	142.8(16)	2.9(44)	1.0(40)	25.7(16)	19.6(18)	103.8(3)	10.4(19)	32.4(6)	3.4(35)	3.5(37)	20.7(24)	8.8(29)	26.0(11)	7.2(20)	4.7(19)
New Zealand	230.3(18)	153.7(7)	4.9(30)	1.9(10)	35.0(4)	26.9(1)	64.8(20)	18.1(12)	30.6(12)	5.5(22)	3.4(40)	14.5(38)	6.4(44)	25.4(14)	7.5(17)	5.2(7)
Northern Ireland	232.3(16)	153.8(6)	3.9(35)	1.8(13)	31.3(9)	22.0(6)	76.0(9)	20.2(10)	31.8(8)	3.3(36)	3.8(31)	19.7(26)	8.5(32)	20.2(27)	6.5(27)	4.3(28)
Norway	202.1(29)	133.9(24)	3.7(38)	1.4(22)	26.9(15)	20.0(16)	38.7(34)	10.4(19)	23.0(26)	4.9(24)	3.3(41)	18.3(31)	8.8(29)	32.3(3)	7.0(23)	4.3(28)
Panama	111.6(49)	91.3(48)	3.8(36)	2.8(4)	7.1(46)	7.1(43)	19.7(46)	5.6(40)	10.8(44)	12.2(5)	3.8(31)	14.7(37)	9.4(27)	20.9(26)	5.0(39)	3.1(46)
Peru	73.2(50)	67.5(50)	0.9(50)	0.3(49)	2.8(50)	2.9(50)	7.6(50)	3.2(49)	5.6(50)	7.8(11)	6.4(14)	18.9(29)	14.1(11)	12.5(39)	2.5(49)	1.8(49)
Poland	246.8(11)	134.1(23)	6.4(17)	1.3(25)	17.5(32)	12.9(31)	80.8(8)	10.3(21)	17.9(32)	9.5(7)	5.4(18)	35.4(6)	13.3(13)	13.4(38)	6.9(24)	4.3(28)
Portugal	178.9(38)	106.1(39)	6.0(20)	1.0(40)	19.0(27)	12.5(34)	30.0(40)	4.8(46)	19.2(30)	2.7(43)	6.9(10)	34.4(8)	17.1(6)	18.9(32)	6.3(30)	4.0(35)
Puerto Rico†	165.7(41)	102.3(44)	13.2(5)	2.2(7)	11.1(41)	10.2(38)	22.5(43)	9.1(25)	15.9(37)	4.2(27)	4.7(24)	17.2(34)	7.6(38)	26.4(10)	5.0(40)	4.7(19)
Romania*	153.2(43)	99.1(47)	5.4(24)	1.4(22)	11.6(39)	8.5(41)	40.0(33)	7.1(38)	15.2(41)	11.4(6)	5.3(19)	25.5(16)	11.1(20)	9.4(44)	4.6(41)	3.6(40)
Scotland	268.1(7)	175.5(2)	4.5(32)	1.9(10)	29.2(13)	21.8(7)	105.2(1)	33.2(1)	34.0(4)	6.1(18)	3.5(37)	19.2(28)	10.3(24)	19.4(28)	6.3(30)	4.1(32)
Singapore	233.4(15)	134.8(22)	17.1(3)	5.8(1)	22.7(23)	20.3(15)	70.4(16)	25.0(4)	15.3(40)	9.4(8)	2.0(48)	31.2(9)	13.9(12)	5.4(48)	4.4(43)	2.8(47)
Soviet Union##	232.3(17)	111.8(37)	7.3(12)	1.2(32)	18.6(29)	13.3(28)	71.5(15)	8.4(29)	14.4(42)	6.5(15)	5.1(21)	48.5(3)	35.0(1)	8.1(46)	6.3(30)	4.0(35)
Spain*	207.6(28)	104.7(41)	6.3(18)	0.9(43)	15.0(36)	10.5(37)	50.9(30)	4.6(47)	17.9(32)	1.6(50)	5.8(16)	22.4(21)	11.1(20)	19.0(31)	6.1(34)	4.1(32)
Surinamet	122.5(47)	100.5(46)	6.0(20)	2.9(3)	8.2(44)	8.5(41)	15.9(47)	5.3(43)	10.3(46)	22.5(2)	4.0(30)	13.2(45)	3.9(49)	19.2(30)	2.2(50)	0.6(50)
Sweden	180.5(36)	131.1(28)	3.4(41)	1.3(25)	25.0(18)	15.8(23)	32.5(36)	10.7(17)	22.2(27)	3.3(36)	3.7(33)	14.3(41)	7.6(38)	29.1(5)	6.5(27)	4.4(25)
Switzerland	242.0(12)	138.4(21)	8.2(9)	1.5(20)	31.4(8)	17.0(21)	62.7(23)	8.0(34)	31.7(9)	4.1(31)	5.0(23)	15.8(35)	7.9(35)	33.3(2)	8.1(10)	3.7(39)
Uruguay	265.3(8)	150.6(9)	8.6(7)	1.3(25)	24.8(19)	21.5(8)	68.7(18)	5.3(43)	31.4(11)	4.8(25)	8.6(4)	24.0(18)	10.5(22)	27.3(7)	7.2(20)	4.7(19)
Yugoslavia†	188.4(35)	108.5(38)	6.5(16)	1.2(32)	16.0(34)	11.7(36)	54.1(28)	8.8(28)	16.0(36)	3.3(36)	8.0(7)	24.7(17)	12.0(19)	12.3(40)	4.0(45)	2.5(48)

NOTE: Figures in parentheses are order of rank within site and sex group. *1984 only. †1984-85 only. ‡1985 only. §1985-86 only. #1984, 1986 only. ##1986 only.
Source of data: World Health Statistics Annuals 1984-1988.

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